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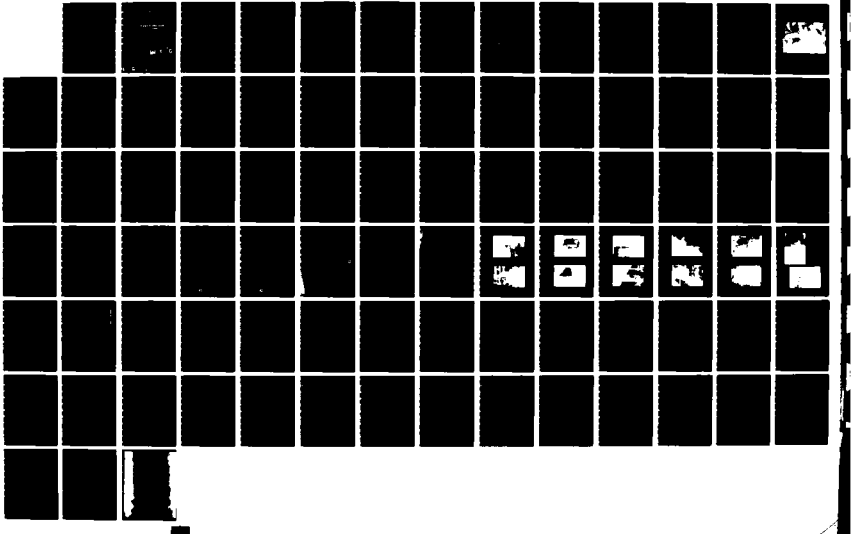

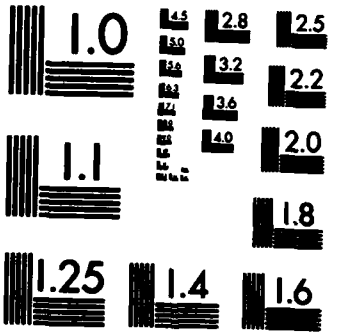

SOUTHWESTERN COASTAL BASIN

WESTPORT, CONNECTICUT

NASH POND DAM
CT 00060

PHASE 1 INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS.

APRIL, 1980

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,
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Westport, Conn.
Nash Pond Dam

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The dam at Nash Pond is constructed of stone masonry, is approx. 105 ft. long, 25 ft. high and ahs a top width of 5 to 7 ft. There have been no significant modifications to the dam since the dam was completed in 1879. The impounded water is primarily used for recreation. The present owner of the dam could not be determined during this report and it is recommended that the State of Conn. ascertain the ownership of the dam. This dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with recommended guidelines established by the Corps of Engineers.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02154

REPLY TO
ATTENTION OF:
NEDED

MAY 05 1980

Honorable Ella T. Grasso
Governor of the State of Connecticut
State Capitol
Hartford Connecticut 06115

Dear Governor Grasso.

Inclosed is a copy of the Nash Pond Dam Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

MAX B. SCHEIDER
Colonel, Corps of Engineers
Division Engineer

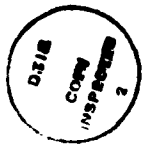
Incl
As stated

SOUTHWESTERN COASTAL BASIN

WESTPORT, CONNECTICUT

NASH POND DAM

CT 00060



PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

Identification No.:	CT 00060
Name of Dam:	Nash Pond Dam
Town:	Westport
County and State:	Fairfield County, Connecticut
Stream:	Stony Brook
Date of Inspection:	November 15, 1979

BRIEF ASSESSMENT

The dam at Nash Pond is constructed of stone masonry, is approximately 105 feet long, 25 feet high and has a top width of 5 to 7 feet. There have been no significant modifications to the dam since the dam was completed in 1879. The impounded water is primarily used for recreation. The present owner of the dam could not be determined during this report and it is recommended that the State of Connecticut ascertain the ownership of the dam.

Based on the visual inspection and past operational performance, the dam is judged to be in FAIR condition. Slight seepage from the masonry joints was noted on the downstream face and some of the joints need repointing. The valve controlling discharge to the 30 inch pipe outlet self-opened in the Summer of 1978 and was subsequently reclosed. A low-level blowoff is believed to exist through the base of the dam.

This dam is classified as SMALL in size and a HIGH hazard potential structure in accordance with recommended guidelines established by the Corps of Engineers. The impoundment storage at the top of the dam is 114 ac.-ft. and the maximum height of the dam is 25 feet. Failure of the dam would result in the loss of more than a few lives and excessive economic loss to the downstream urbanized area, two commercial buildings, 2 - 3 residential homes, and an apartment building.

The test flood for this dam is 1/2 the Probable Maximum Flood (PMF). The test flood has an inflow equal to 2650 cfs and an outflow discharge equal to 2570 cfs with a stillwater elevation of 64.0 which will overtop the dam by 3.8 feet in a stillwater condition. The maximum outflow capacity of the spillway under stillwater conditions is 250 cfs which is 10 percent of the test flood.

It is recommended that the following items be studied further: The operability of the low-level blowoff, the valve for the 30 inch pipe as to leakage and operability, the downstream toe, the upstream face, and the spillway capacity.

The following remedial measures should be taken: The removal of vegetation from and re-pointing of joints on the dam, the monitoring of seepage, the development of a downstream warning plan and an inspection program, the removal of trees near the downstream face of the dam, and the clearing of the downstream channel.

Recommendations and remedial measures that should be implemented within one year of receipt of this Phase I Inspection Report are further described in Section 7.

JAMES P. PURCELL ASSOCIATES, INC.

Sudhir A. Shah

Sudhir A. Shah, P.E.
Vice-President
Connecticut P.E. No. 8012

This Phase I Inspection Report on Nash Pond Dam has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Carney M. Terzian

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

Richard J. DiBuono

RICHARD DIBUONO, MEMBER
Water Control Branch
Engineering Division

ARAMAST MAHTESIAN, CHAIRMAN
Geotechnical Engineering Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation. However, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there by any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and downstream damage potential.

The Phase I Investigation does not include an assessment of the need for fences, gates, no-trespassing signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with OSHA rules and regulations is also excluded.

TABLE OF CONTENTS

Section	Page
Letter of Transmittal	
Brief Assessment	
Review Board Page	
Preface	i
Table of Contents	ii-iv
Overview Photo	v
Location Map	vi

REPORT

1. Project Information

1.1 General 1

a. Authority
b. Purpose of Inspection

1.2 Description of Project 1

a. Location
b. Description of Dam and Appurtenances
c. Size Classification
d. Hazard Classification
e. Ownership
f. Operator
g. Purpose of Dam
h. Design and Construction History
i. Normal Operational Procedure

1.3 Pertinent Data 3

2. Engineering Data

2.1 Design 8

TABLE OF CONTENTS (Cont'd)

Section		Page
2.2	Construction	8
2.3	Operation	8
2.4	Evaluation	8
3. Visual Inspection		
3.1	Findings	9
	a. General b. Dam c. Appurtenant Structures d. Reservoir Area e. Downstream Channel	
3.2	Evaluation	11
4. Operational and Maintenance Procedures		
4.1	Operational Procedures	12
4.2	Maintenance of the Dam	12
4.3	Maintenance of the Operating Facilities	12
4.4	Description of Any Warning System in Effect	12
4.5	Evaluation	12
5. Evaluation of Hydraulic/Hydrologic Features		
5.1	General	13
5.2	Design Data	13
5.3	Experience Data	13
5.4	Test Flood Analysis	13
5.5	Dam Failure Analysis	14

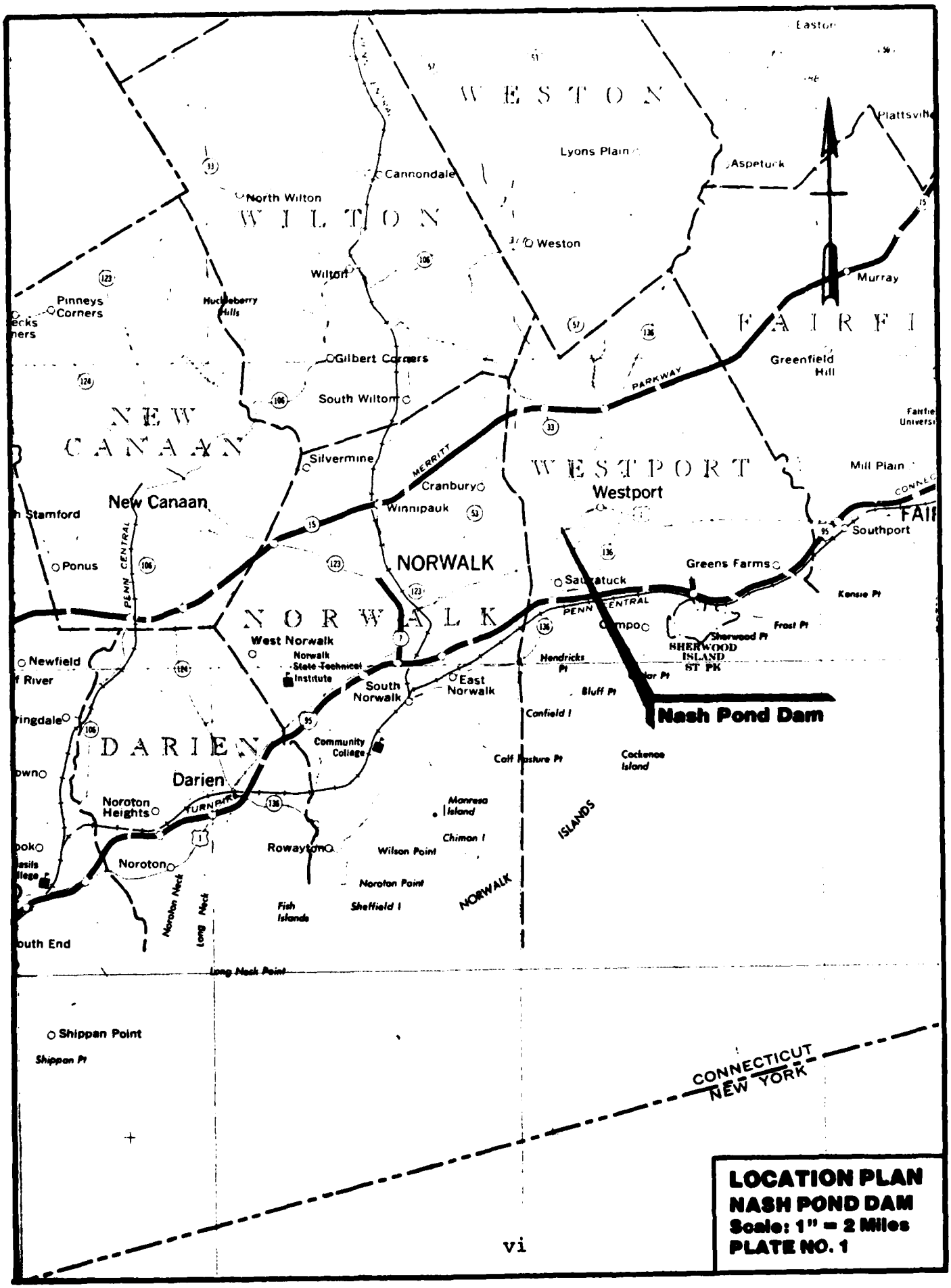
TABLE OF CONTENTS (Cont'd)

Section		Page
6. Evaluation of Structural Stability		
6.1	Visual Observations	15
6.2	Design and Construction	15
6.3	Post-Construction Changes	15
6.4	Seismic Stability	15
7. Assessment, Recommendations and Remedial Measures		
7.1	Dam Assessment	16
	a. Condition b. Adequacy c. Urgency	
7.2	Recommendations	16
7.3	Remedial Measures	16
	a. Operation and Maintenance Procedures	
7.4	Alternatives	17

APPENDIXES

Appendix A -	Inspection Checklist	A-1
Appendix B -	Engineering Data	B-1
Appendix C -	Photographs	C-1
Appendix D -	Hydrologic and Hydraulic Computations	D-1
Appendix E -	Information as Contained in the National Inventory of Dams	E-1

OVERVIEW PHOTO - NASH POND DAM



LOCATION PLAN
NASH POND DAM
Scale: 1" = 2 Miles
PLATE NO. 1

NATIONAL DAM INSPECTION PROGRAM

PHASE I - INSPECTION REPORT

NAME OF DAM: NASH POND DAM

SECTION 1

PROJECT INFORMATION

1.1 General

a. **Authority:** Public Law 92-367, August 8, 1972, authorized the Secretary of the Army through the Corps of Engineers to initiate a national program of dam inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. James P. Purcell Associates, Inc. has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed was issued to James P. Purcell Associates, Inc., under a letter from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0002 has been assigned by the Corps of Engineers for this work.

b. **Purpose**

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the States to initiate quickly, effective dam safety programs for non-Federal dams.

3. To update, verify and complete the National Inventory of Dams.

1.2 Description of the Project

a. **Location:** The Nash Pond Dam is located in Fairfield County, Connecticut, in the Town of Westport, approximately 0.7 miles southwest of Westport along Route 1 (See Plate No. 1). The dam impounds water from Stony Brook and is located approximately 3000 feet upstream of the Saugatuck River and immediately upstream of an apartment and commercial buildings. The impoundment is situated in a northwest/southeast direction, with the dam at the southeast end. The latitude is 41° -8'-14" and the longitude is 73° -22'-21".

All elevations used in this report are based on the National Geodetic Vertical Datum (NGVD). Elevations are based on a spillway crest elevation of 57.0 estimated from available mapping.

b. **Description of Dam and Appurtenances:** Nash Pond Dam is constructed of stone masonry and apparently with abutments and foundation keyed into rock. The length at the top of the dam is 105 feet and maximum depth is about 25 feet. The spillway is granite and is located in the center of the dam. It is an uncontrolled broad crested weir with a length of 16 feet and a crest elevation of 57.0. The maximum top width of the dam is approximately 7 feet and is 3.2 feet above the top of the spillway. The downstream face of the dam is vertical and is slightly arched in plan. The downstream channel has a natural bottom with a stone wall defining the east side downstream of the dam. This stone wall functions as a retaining wall for a building located approximately 50 feet downstream of the dam. The west side of channel has brush and small trees lining the bank, and a building approximately 40 feet downstream of the dam.

Outlet works consist of a butterfly valve, with a manually operated control mechanism located in a masonry block on the east crest of the dam. The butterfly valve has an 18-inch or 24-inch square opening. This valve controls discharge into a 30-inch pipe extending from the dam along the east side of the downstream channel. The 30-inch pipe has two (2) 24-inch open blowoff ports, and transitions to a short length of 18-inch pipe at a sealed terminus. The purpose of this outlet structure is not known, but presumably, it was part of an uncompleted system for providing water power to the adjacent factory building. The low-level blowoff is reportedly the 2 foot by 2 foot opening in the lower east corner of the downstream face. Its intake location, condition and operability is unknown. However, it is possible that it is controlled by the smaller mechanism on the east crest of the dam.

c. **Size Classification:** The size classification of this dam is SMALL as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers. The impoundment storage at the top of the dam is 114 ac.-ft. (within the range 50-1000 ac.-ft.) and the maximum height of the dam is 25 feet (within the range 25-40 feet). The size classification is governed by height and storage.

d. **Hazard Classification:** The hazard classification of this dam is HIGH as per the criteria set forth in the Recommended Guidelines for Safety Inspection of Dams, by the Corps of Engineers. The failure of the dam would result in the loss of more than a few lives and excessive economic loss to the downstream urbanized area and to the two commerical buildings located along the spillway channel immediately downstream of the dam. Failure discharge can cause damage due to

high velocity impact from debris and flooding. The buildings immediately downstream will be inundated by approximately 12 feet and the confluence with the Saugatuck River would be flooded by approximately 3 feet.

e. **Ownership:**The present ownership of Nash Pond Dam could not be determined during this study. The last known owner was the Nash family:

Mrs. Edward Nash, Jr.
P.O. Box 184
Saugatuck Station
Westport, Connecticut 06880

It is possible that the present owner is the Nash - Webber Trust or the Nash Pond Association.

f. **Operator:**There is no assigned operator of the Nash Pond Dam. The operation is informal and provided by either the Nash - Webber Trust or the Nash Pond Association.

g. **Purpose of Dam:**Nash Pond Dam impounds water from Stony Brook and is presently used for recreational and aesthetic purposes.

h. **Design and Construction History:**Nash Pond Dam, as it appears today, was constructed in 1879. It is believed that some type of structure, prior to the existing dam, has existed at this site since the 1700s. No design or construction plans are known to be in existence.

i. **Normal Operating Procedures:**Normally all water is discharged over the spillway and operation of the butterfly valve is not regularly performed.

1.3 Pertinent Data

a. **Drainage Area:**The Nash Pond Dam is located in Fairfield County, Connecticut. The drainage basin lies approximately 0.5 miles upstream of the confluence of Stony Brook with the Saugatuck River. The basin is generally rectangular in shape having a length of 3.8 miles and an average width of 0.8 miles. The total drainage area to the dam is 3.05 square miles (see drainage basin map in Appendix D). The topography is a generally moderate to steep terrain, with elevations ranging from a high of 370 feet to 57 feet at the spillway crest. Stream slopes are flat having average grades of 0.7 percent. The pond has a normal surface area of 11 acres which is 0.6 percent of the drainage area.

b. **Discharge at Dam Site:**There is no specific discharge records available for this dam. Listed below are calculated discharge values for the spillway and outlet works (30 inch pipe).

1. Outlet Works: A 30 inch pipe with an intake approximately at elevation 51 and a discharge capacity of 50 cfs at elevation 57.0.

2. Maximum known flood at dam site: Calculated to be approximately 650 cfs in 1955 based on a reported water level of 1.0 foot over the top of the dam.

3. Spillway capacity at top of dam: 250 cfs at elevation 60.2.

4. Spillway capacity at test flood elevation: 800 cfs at elevation 64.0.

5. Gated outlet capacity at normal pool elevation: 50 cfs at elevation 57.0.

6. Gated outlet capacity at test flood elevation: 80 cfs at elevation 64.0.

7. Gated outlet capacity at top of dam elevation: 65 cfs at elevation 60.2.

8. Total project discharge at top of dam: 315 cfs at elevation 60.2.

9. Total project discharge at test flood elevation: 2650 cfs at elevation 64.0.

c. Elevation (Ft. above NGVD)

1.	Stream bed at toe of dam	35+/—
2.	Bottom of cutoff	Unknown
3.	Maximum tailwater	Unknown
4.	Recreation pool	N/A
5.	Full flood control pool	N/A
6.	Spillway crest (Normal Pool)	57.0
7.	Design surcharge (Original Design)	Unknown
8.	Top of dam	60.2
9.	Test flood level	64.0

d. Reservoir (Length in feet)

1.	Normal pool	2200
2.	Flood control pool	N/A

3.	Spillway crest pool	2200
4.	Top of dam	3000
5.	Test flood pool	3500
e.	**Storage (acre-feet)**	
1.	Normal pool	58
2.	Flood control pool	N/A
3.	Spillway crest pool	58
4.	Top of dam	114
5.	Test flood pool	233
f.	**Reservoir Surface (acres)**	
1.	Normal pool	11
2.	Flood control pool	N/A
3.	Spillway crest	11
4.	Test flood pool	35
5.	Top of dam	25
g.	**Dam**	
1.	Type	Stone Masonry
2.	Length	105 feet
3.	Height	25 feet
4.	Top Width	5 to 7 feet
5.	Side Slopes	Upstream: Vertical above spillway level Downstream: Vertical

6.	Zoning	Unknown
7.	Impervious Core	Unknown
8.	Cutoff	Unknown
9.	Grout Curtain	Unknown

h. Diversion and Regulating Tunnel — **N/A**

i. Spillway

1.	Type	Overflow broad crested uncontrolled weir
2.	Length of weir	16.0 ft.
3.	Crest elevation	57.0
4.	Gates	None
5.	U/S Channel	Natural bed
6.	D/S Channel	Stone walls and buildings along banks

j. Regulating Outlets

Refer to Paragraph 1.2b "Description of Dam and Appurtenances" for description of Outlet Works.

1.	Size and inverts	30 inch pipe: Invert 51.+/— Low-level Blowoff: Invert unknown.
2.	Description	30 inch pipe: Cast iron. Low-level blowoff: Unknown

3.	Control mechanism	Hand operated gear mechanisms on the top of the dam.

SECTION 2

ENGINEERING DATA

2.1 Design

There are no available records presenting design information for the construction of the Nash Pond Dam.

2.2 Construction

There are no available records of the construction or subsequent repairs to this dam.

2.3 Operation

No formal records of operation are maintained for this facility.

2.4 Evaluation

a. **Availability:** The information concerning this dam was gathered only by field investigation and meetings with representatives of the Nash - Webber Trust.

b. **Adequacy:** The lack of indepth engineering did not allow a definite review. Therefore, the adequacy of this dam could not be assessed from the standpoint of reviewing design and construction data, but is based primarily on the visual inspection, the dam's past performance, and sound engineering judgment.

c. **Validity:** The validity of the limited information available could not be verified.

SECTION 3

VISUAL INSPECTION

3.1 Findings

a. **General:** The visual inspection of the Nash Pond Dam was conducted on November 15, 1979 and a copy of the visual inspection check list is contained in Appendix A of this report.

The following procedure was used;

1. Inspection of the upstream area of the pond created by the dam.

2. Visual inspection of the face and crest of the dam and the spillway for cracks, loose stones, leakage, etc.

3. Inspection of the outlet works and other appurtenances as to their existence, location, and operability.

4. Review of procedures that could be utilized in the event of an emergency situation.

5. A check of the downstream area for seepage, piping, boils or other indications of abnormal conditions. The downstream hazard potential in the event of dam failure was investigated.

6. Photographs of the general area of the dam and of specific items of note were taken and are included in Appendix C of this report.

Before the inspection, the available existing data and aerial photographs were studied and reviewed.

b. **Dam**

1. Crest: The top of the dam is constructed of stone masonry with no evidence of settlement or misalignment (Photos C-3, C-4). Grass is growing between some of the stones. The east crest supports the control mechanisms for the outlet works. The crest width varies from approximately 5 feet (west crest and east abutment) to 7 feet (east crest at the spillway).

2. Upstream Face: The upstream face of the dam is stone masonry with a vertical face above the water level at the time of the inspection, which was approximately 34 inches below the top of the dam. The face is free of vegetation (Photo C-2).

3. Downstream Face: The downstream face is also stone masonry with a vertical face. Grass and vines are growing on the face and small trees are growing from the ground immediately below the dam (Photo C-1). Leakage was noted on the downstream face below both the dam's east crest (Photo C-8) and west crest (Photo C-9). The dam appears to be keyed into rock at both abutments.

   The face below the dam's east crest contains a plaque which reads "Erected by E. H. Nash, 1879. B. H. Hull, Engineer" (Photo C-10).

c. Appurtenant Structures

1. Spillway: The spillway is a 16 foot long and 5 foot wide broad crested weir with a 16.8 foot free drop to the tailwater (Photo C-1). It is constructed of capstones which overhang the downstream face of the dam by approximately 6 inches (Photo C-4). Water was flowing over the spillway at the time of the inspection. Mortar is missing from the joints between the stones on the wall at the west end of the spillway (Photo C-4).

2. Low Level Outlet: A 2 foot by 2 foot square opening in the downstream face (Photo C-7) indicates the presence of a low level outlet. No other information concerning this outlet was available from the visual inspection. It is possible that the smaller mechanism on the east crest (Photo C-6) is the control for this outlet. No record of past operation was available from the representative of the Nash - Webber Trust.

3. 30 Inch Pipe Outlet: This outlet is regulated by an 18 or 24 inch square butterfly valve controlled by the larger mechanism on the east crest (Photo C-5). The invert is unknown but presumed to be 6 to 12 feet below the top of the dam. The pond was drained via this outlet in the 1960s. In the Summer of 1978, the butterfly valve self-opened and drew down the pond approximately 1 foot before being reclosed by members of the Nash - Webber Trust and the Nash Pond Association. Reportedly, the valve requires a precise orientation in the open position to prevent it from turning 180 degrees and reclosing.

   The 30 inch cast iron pipe extends through the dam and along the east bank of the downstream channel within a masonry wall and a building foundation wall. The pipe exits the building wall and continues along the east bank to a sealed terminus consisting of a short section of 18 inch pipe and a 42 inch diameter tank-like structure on each side. Reportedly, these structures at the terminus were part of an unconstructed water power facility for the adjacent building.

Two 24 inch blow-offs, one vertical (Photo C-11) and one horizontal, allow the discharge of water to the channel. The pipe has rusted through in places and leakage from the wall along the east bank containing the pipe below the dam is occurring. This indicates possibly a rusted pipe and leaking valve or leakage through the dam along the pipe.

d. **Reservoir Area:**The impoundment created by the dam is a relatively narrow flooded portion of the natural riverbed. There are gentle slopes on the valley walls surrounding the reservoir, and bedrock appears to be at or near the surface. No geologic features were detected that could be expected to adversely affect the dam or its appurtenant structures.

Trespassing on the dam is prohibited. However, the area is not fenced and is located near well traveled roads. Evidence of trespassing was noted during this inspection in the form of paths through the woods leading to the dam.

e. **Downstream Channel:**The downstream channel is fairly straight and uniform with walls or buildings lining each bank (Photo C-12) except for approximately 40 feet immediately below the dam on the west side. Numerous trees overhang the channel and the channel contains considerable brush, debris, snags and vegetative growth.

3.2 Evaluation

Based on the visual inspection, the Nash Pond Dam appears to be in fair condition overall, and there were no major areas of distress noted. Specific areas of concern that were noted are:

The presence of leakage and vegetative growth on the downstream face of the dam.

The missing mortar on the spillway wall at the west edge.

The possible leakage along or through the 30 inch outlet works.

The structural capacity cannot be evaluated due to the unknown conditions within and below the dam.

SECTION 4

OPERATIONAL AND MAINTENANCE PROCEDURE

4.1 Operational Procedures

There are presently no operational procedures for the Nash Pond Dam. It has only a recreational purpose at this time.

4.2 Maintenance of the Dam

There is no regular maintenance schedule for this dam. The downstream channel has a natural bottom, and stone retaining walls form the banks. Upstream of the dam, the shore is in a natural state.

4.3 Maintenance of the Operating Facilities

No maintenance of the outlet works is presently performed. There is no record of prior operation of the low level blowoff and, due to years of activity and the accumulation of silt, it is probable that this outlet is inoperable. The butterfly valve for the 30 inch pipe opened by itself in the Summer of 1978, and was subsequently reclosed.

4.4 Description of Any Warning System in Effect

No formal emergency or contingency plan is in effect to reduce or minimize downstream damage.

4.5 Evaluation

To insure the safety of the residents and industries downstream, a regular inspection and maintenance program should be developed and implemented.

SECTION 5

EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The Nash Pond Dam creates an impoundment with a total storage capacity of 58 ac.-ft. at elevation 57.0, the spillway crest elevation. Each foot of depth in the reservoir above the spillway crest can accommodate approximately 18 ac.-ft. The drainage area is 3.05 square miles and the normal pond area is 11 acres or 0.6 percent of the watershed. Stream slopes are flat having average grades of 0.7 percent. The spillway is a 5 foot wide broad crested weir 16 feet in length and 3.2 feet below the top of the dam.

5.2 Design Data

a. No specific design data is available for this watershed or the structures of the Nash Pond Dam. In lieu of existing design information, USGS topographic maps (scale 1"=2000') were utilized to develop hydrologic parameters such as drainage area, basin length, time of concentration, and other runoff characteristics. Elevation-storage relations for the Nash Pond were approximated. The pond surface area and surcharge storage was computed using the USGS maps. Some of the pertinent hydraulic design data was obtained and/or confirmed by actual field measurements at the time of the visual inspection.

b. Outflow values (routing procedures) and dam overtopping analyses were computed in accordance with the guidelines developed by the Corps of Engineers. Judgment was used in calculating final values outlined in this report, which are quite approximate and should not be considered a substitute for actual detailed analysis.

5.3 Experience Data:

Historical data for recorded discharges is not available for this dam. The maximum discharge to date occurred in 1955 and was calculated to be approximately 650 cfs corresponding to a reported water level of 12 inches over the top of the dam. Several houses upstream were reportedly flooded.

5.4 Test Flood Analysis:

Recommended guidelines for the Safety Inspection of Dams by the Corps of Engineers were used for the selection of the "Test Flood". This dam is classified as a HIGH

hazard and SMALL size structure. Guidelines indicate that a range of 1/2 to the full Probable Maximum Flood (PMF) be used as the "Test Flood" for these classifications. A test flood of 1/2 PMF was chosen because of the size on the low side of the small category and the hazard is on the low side of the high category. The watershed has a total area of 3.05 square miles. Snyder's lag was calculated to be 3.6 hours and a Snyder peaking coefficient of 0.625 was used. The 200 square mile - 24 hour probable maximum precipitation (PMP) is 22 inches. The flood hydrograph package, HEC-1 computer program, developed by the Corps of Engineers was utilized to develop the inflow hydrograph, route the flood through the reservoir, and for the dam overtopping analysis. The test flood inflow was calculated to be 2650 cfs. The outlet works were assumed to be closed for this analysis.

The spillway capacity is hydraulically inadequate to pass the "Test Flood" (1/2 PMF) and overtopping of the dam will occur. The maximum outflow capacity of the spillway without overtopping the dam is 250 cfs. This corresponds to 10 percent of the test flood and a storage above the spillway level of 56 ac.-ft. The maximum outflow discharge value for the test flood is 2570 cfs corresponding to a depth of flow over the top of the dam of 3.8 feet and a storage above the spillway level of 175 ac.-ft. A spillway rating curve, outlet works rating curve, and a reservoir surface area-capacity curve are included in Appendix D of this report.

At the spillway crest elevation of 57.0, the capacity of the 30 inch outlet structure is 65 cfs. It will require approximately 3 hours to lower the water level the first foot assuming a water surface area of 11 acres, normal inflow conditions, and use of the outlet works to regulate the water level for expected inflows. When the pond was drained in the 1960s, it reportedly took several days to completely drain the lake.

5.5 Dam Failure Analysis

This dam is classified as a high hazard structure. Failure discharge can cause the loss of more than a few lives and damage due to high velocities, impact from debris, and flooding to 2 - 3 residential homes and two commercial buildings along the downstream channel. Also, an apartment building immediately downstream of the dam would suffer damage in the event of a dam failure.

The calculated dam failure discharge is 3360 cfs at a pool level equal to the top of the dam. At this elevation, the downstream discharge before failure will be the full spillway capacity of 250 cfs corresponding to a depth of flow of 1-2 feet in the downstream channel. Failure will produce a water surface level of approximately 12.0 feet immediately downstream from the dam. The failure discharge will effect downstream areas for a distance of 3000 feet from the dam. At this distance, the water surface level will be approximately 0 - 1 foot above normal observations as it enters the Saugatuck River. Beyond 3000 feet, the effects of the failure discharge will be reduced as it enters the Saugatuck River. Water surface elevations due to the failure of the dam are listed in Appendix D. Probable consequences including the prime impact areas are also listed in Appendix D.

SECTION 6

EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observation

The visual inspection revealed no signs of major physical distress in the structure. However, leakage was noted on the downstream face.

6.2 Design and Construction Data

There is insufficient design and construction data to permit a formal evaluation of stability.

6.3 Post-Construction Changes

An older dam is thought to have existed at the site since the 1700s. The present dam was built in 1879 and is believed to have remained essentially unchanged.

6.4 Seismic Stability

The dam is in Seismic Zone 1 and hence does not require evaluation for seismic stability according to the Corps of Engineers Recommended Guidelines.

SECTION 7

ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. **Condition:** Based on the visual inspection, past performance and hydraulic/hydrologic evaluation, the Nash Pond Dam and appurtenances are judged to be generally in FAIR condition. Items of concern that should be addressed as a result of this inspection are listed in Sections 7.2 and 7.3.

b. **Adequacy of Information:** The absence of existing engineering data did not allow for definitive review. Therefore, the adequacy of the dam is based on visual inspection, past performance history, and engineering judgment.

c. **Urgency:** The recommendations and remedial measures described below should be implemented by the owner within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

It is recommended that the owner engage a qualified registered engineer to carry out the following actions and that his recommendations be implemented.

a. The location, condition and operability of the low level blowoff be ascertained.

b. A reliable procedure for operation of the 30 inch pipe outlet be designed, and the outlet works checked for leakage along the pipe or through the valve.

c. A detailed hydrologic/hydraulic investigation to determine the need and means of increasing the discharge capacity of the project.

d. The upstream face of the dam be visually inspected.

e. The downstream toe be checked for potential undermining.

7.3 Remedial Measures

a. Operational and Maintenance Procedures

1. The vegetation should be removed from the joints and the joints repointed on the faces and crest of the dam, as required.

2. The seepage on the downstream face should be monitored to note any change from the existing conditions.

3. Develop a downstream warning and surveillance plan, including round-the-clock monitoring during heavy precipitation.

4. Institute a program of annual periodic technical inspection with special emphasis on the joint between the dam and the abutments at the valley walls.

5. The trees in the vicinity of the downstream face of the dam should be removed and the downstream channel cleared of debris, snags and vegetation.

7.4 Alternatives

Remove the dam.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Nash Pond Dam

DATE November 15, 1979

TIME 8:30 - 10:30 A.M.

WEATHER Clear

W.S. ELEV. _____ U.S. _____ DN.S.

PARTY:

1. R. Johnston, JPPA
2. R. Lyon, JPPA
3. J. Chastanet, CWDD
4. _____
5. _____
6. J. Webber, Nash-Webber Trust
7. _____
8. _____
9. _____
10. _____

	PROJECT FEATURE	INSPECTED BY	REMARKS
1.	Hydraulics	R. Johnston	
2.	Structural	R. Lyon	
3.	Geotechnical	J. Chastanet	
4.			
5.			
6.			
7.			
8.			
9.			
10.			

INSPECTION CHECK LIST

PROJECT Nash Pond Dam DATE November 15, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation 60.2	Good - stone masonry
Current Pool Elevation 57.0	34" below crest
Maximum Impoundment to Date	1 foot over crest in 1955
Surface Cracks	Minor cracks in mortar and small open joints
Pavement Condition	N/A
Movement or Settlement of Crest	None observed
Lateral Movement	None observed
Vertical Alignment	Good
Horizontal Alignment	Possible bulge by a few stones in the downstream face
Condition at Abutment and at Concrete Structures	Abutments apparently founded on rock
Indications of Movement of Structural Items on Slopes	None observed
Trespassing on Slopes	Not permitted
Vegetation on Slopes	Grass and vines on downstream face
Sloughing or Erosion of Slopes or Abutments	None observed
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None observed
Unusual Embankment or Downstream Seepage	Slight steady seepage at abutments and downstream face
Piping or Boils	None observed
Foundation Drainage Features	None observed
Toe Drains	None observed
Instrumentation System	None observed

INSPECTION CHECK LIST

PROJECT Nash Pond Dam DATE November 15, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Entire lake bed under water
b. Intake Structures	
30 inch pipe	A square butterfly valve approximately 18 inches to 24 inches controls discharge into the 30 inch pipe. Operated by a valve stem extending from masonry block on the east crest. Reportedly operational.
Low Level Blowoff	Intake location, condition and operability unknown. Possibly controlled by the smaller mechanism on the east crest.

INSPECTION CHECK LIST

PROJECT Nash Pond Dam DATE November 15, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	
a. 30 inch pipe	A 30 inch metal pipe encased in masonry leads from the dam, along the wall of the building on the east bank below the dam. The pipe exits the building and continues on piers to a capped end. The pipe has rusted through in places.
b. Low Level Blowoff	Location, type and condition of conduit unknown.

INSPECTION CHECK LIST

PROJECT Nash Pond Dam DATE November 15, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
a. 30 inch pipe	The pipe terminates in a sealed end with a 42 inch diameter tank-like structure on each side. One vertical and one horizontal 24 inch open blowoffs located upstream of the terminus will allow water to be discharged from the pipe.
b. Low Level Blowoff	A 2 foot by 2 foot square opening in the downstream face of the dam.

INSPECTION CHECK LIST

PROJECT Nash Pond Dam DATE November 15, 1979

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	Entire lake bed - under water.
General Condition	
Loose Rock Overhanging Channel	
Trees Overhanging Channel	
Floor of Approach Channel	
b. Weir	
General Condition of Masonry	Good
Rust or Staining	N/A
Spalling	None observed
Any Visible Reinforcing	None observed
Any Seepage or Efflorescence	Spillway flowing - none visible.
Drain Holes	None observed
c. Discharge Channel	Rectangular masonry channel and buildings.
General Condition	Fair - masonry deteriorating, debris and snags in the channel.
Loose Rock Overhanging Channel	None observed
Trees Overhanging Channel	Yes
Floor of Channel	Debris, snags, stones
Other Obstructions	Stone piers for 30 inch pipe.

APPENDIX B

ENGINEERING DATA

APPENDIX B-1

DESIGN, CONSTRUCTION AND MAINTENANCE RECORDS AND LOCATION

Mr. Victor J. Galgowski
Dam Safety Engineer
Water and Related Resources Unit
Department of Environmental Protection
State of Connecticut
State Office Building
Hartford, Connecticut 06115

APPENDIX B-2

COPIES OF PAST INSPECTION REPORTS

BUCK & BUCK

ENGINEERS

71 CAPITOL AVENUE, HARTFORD, CONNECTICUT 06106

JAMES A. THOMPSON
ROBINSON W. BUCK

Comm. 5713-59

February 14, 1972

Mr. William H. O'Brien III
Department of Environmental Protection
Water and Related Resources
State Office Building
Hartford, Connecticut 06115

Re: Nash Pond
Stoney Brook
Westport, Connecticut

Dear Mr. O'Brien:

While in the vicinity of Lee Pond, we made an inspection of the subject dam.

It is a massive stone masonry structure built in 1879 in excellent condition. There is some minor leakage on the south face; but, in general, the dam appears very sound.

Sincerely yours,

BUCK & BUCK

James A. Thompson

No. 604.1

Inventoried By WNS

Date 21 JULY 1964

WATER RESOURCES COMMISSION
SUPERVISION OF DAMS
INVENTORY DATA

Name of Dam or Pond NASH POND

Code No. 5.1 2 2 ST 0 5

Nearest Street Location KINGS HIGHWAY

Town WESTPORT

U.S.G.S. Quad. WESTPORT

Name of Stream STONY BROOK

Owner EDWARD C. NASH ?

Address 31 KINGS HIGHWAY

WESTPORT

Pond Used For RECREATION DA 3.075 sq mi

Dimensions of Pond: Width 200 FEET Length 2000 FEET Area 6.0 ACRES

Total Length of Dam 100 FEET Length of Spillway 15 FEET

Location of Spillway CENTER OF DAM

Height of Pond Above Stream Bed 25 FEET

Height of Embankment Above Spillway 3 FEET

Type of Spillway Construction MASONRY

Type of Dike Construction MASONRY

Downstream Conditions WESTPORT

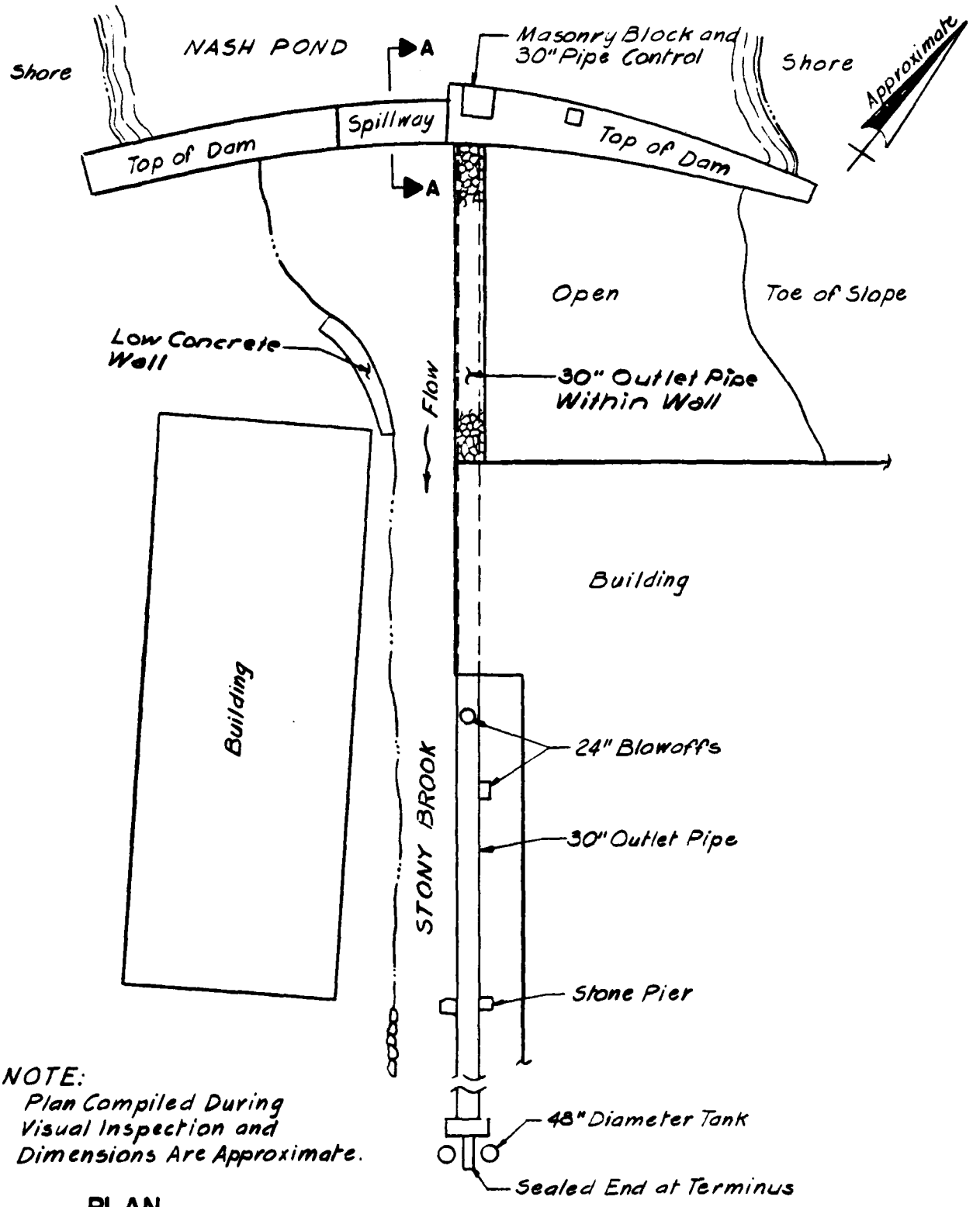
Summary of File Data

Remarks LEAKAGE NOTED ON WEST ABUTMENT
DAM BUILT 1879

Would Failure Cause Damage? YES Class B

APPENDIX B-3

RECORD DRAWINGS AND SKETCHES



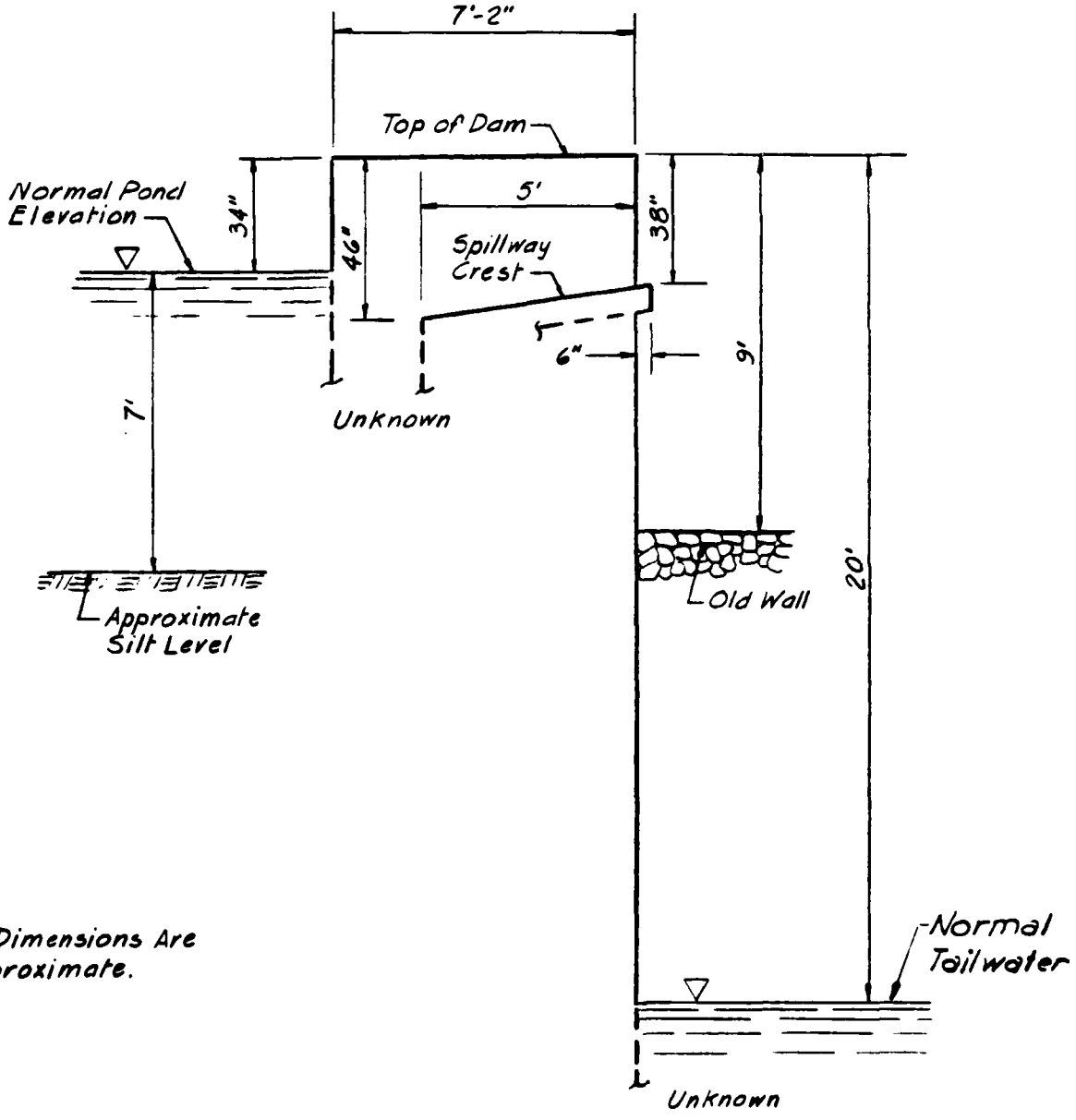
NOTE:
Plan Compiled During
Visual Inspection and
Dimensions Are Approximate.

PLAN

SCALE: 1"=20'±

NASH POND DAM

JAMES P. PURCELL ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS



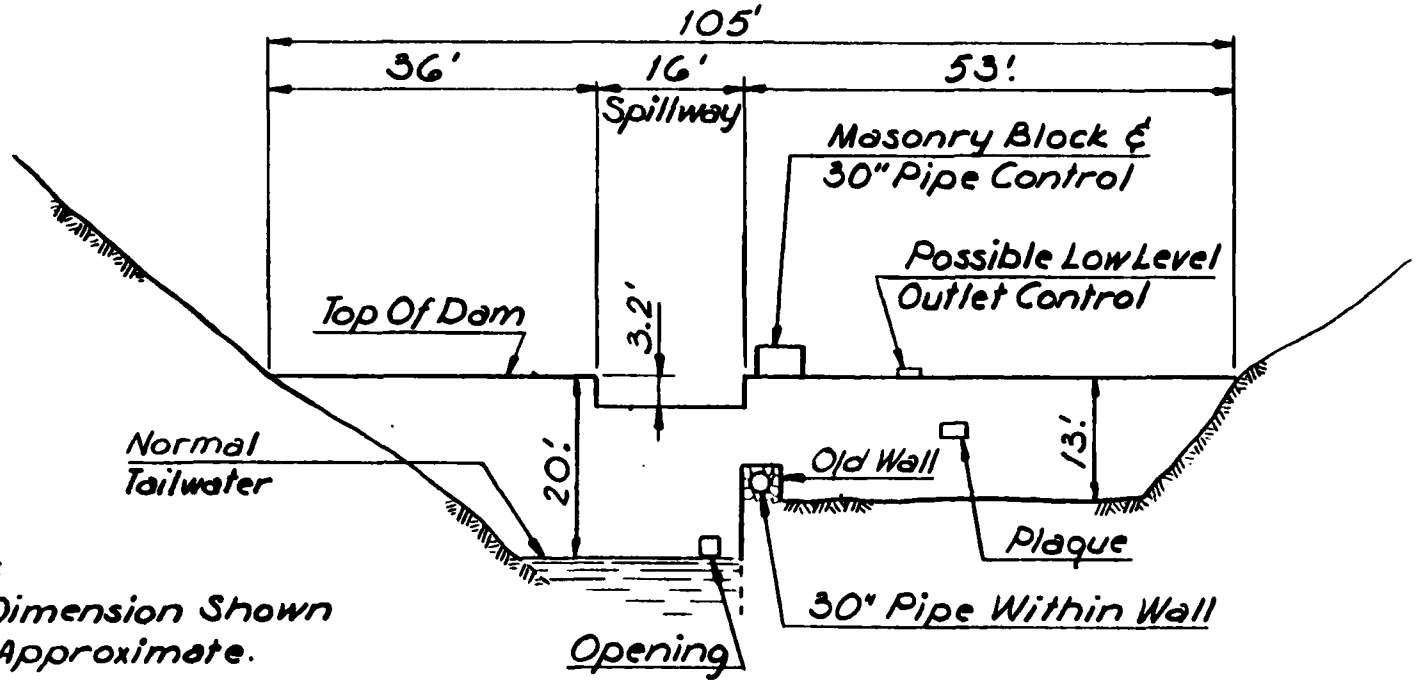
NOTE:
All Dimensions Are Approximate.

SECTION A-A

SCALE: 1" = 4'

NASH POND DAM

JAMES P. PURCELL ASSOCIATES, INC.
ENGINEERS • ARCHITECTS • PLANNERS



ELEVATION OF THE DAM LOOKING UPSTREAM

SCALE: 1" = 20'

B-8

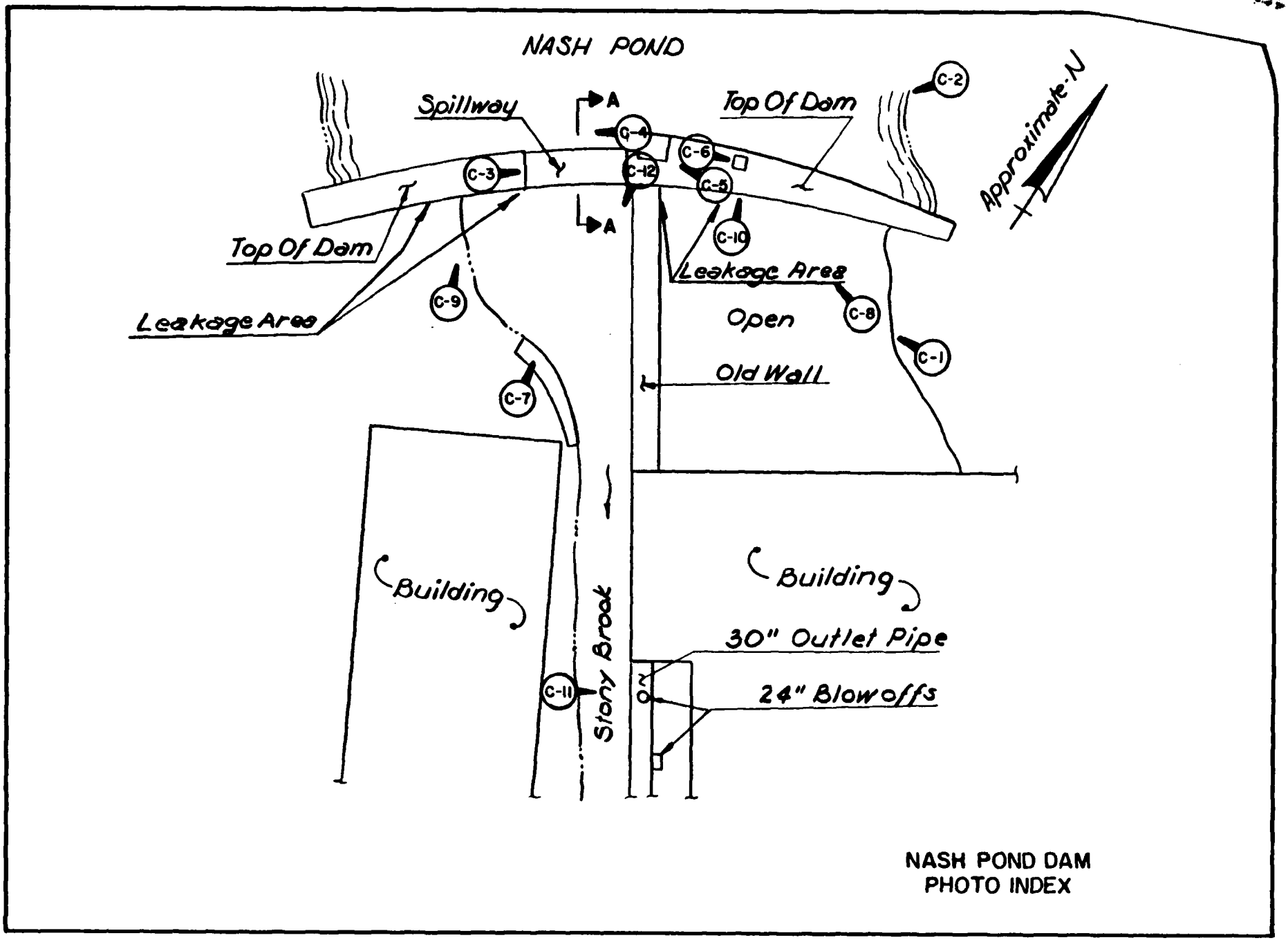
NASH POND DAM

JAMES P. PURCELL ASSOCIATES, INC.

ENGINEERS • ARCHITECTS • PLANNERS

APPENDIX C

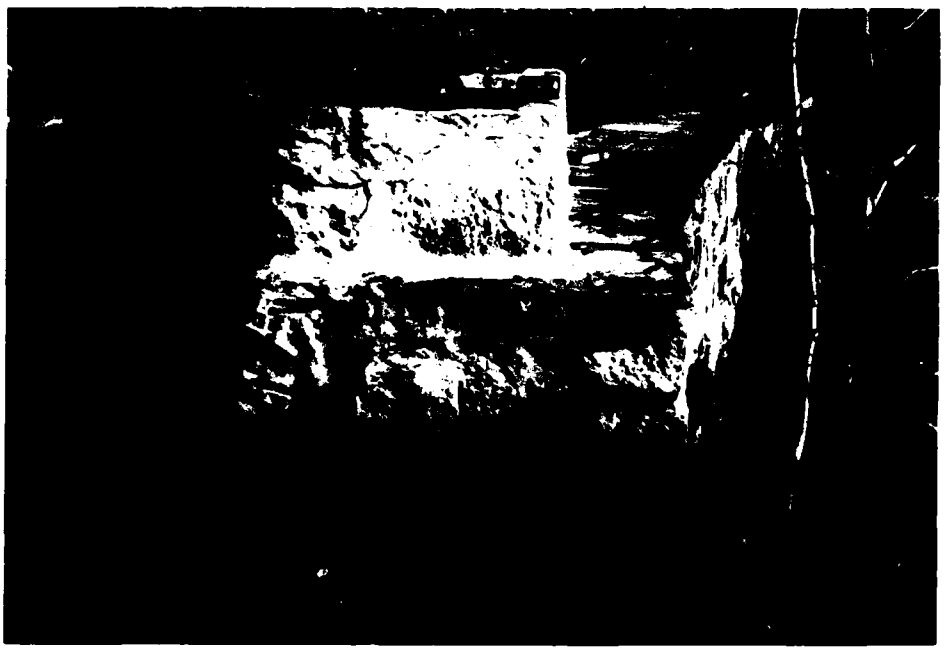
PHOTOGRAPHS



NASH POND DAM
PHOTO INDEX

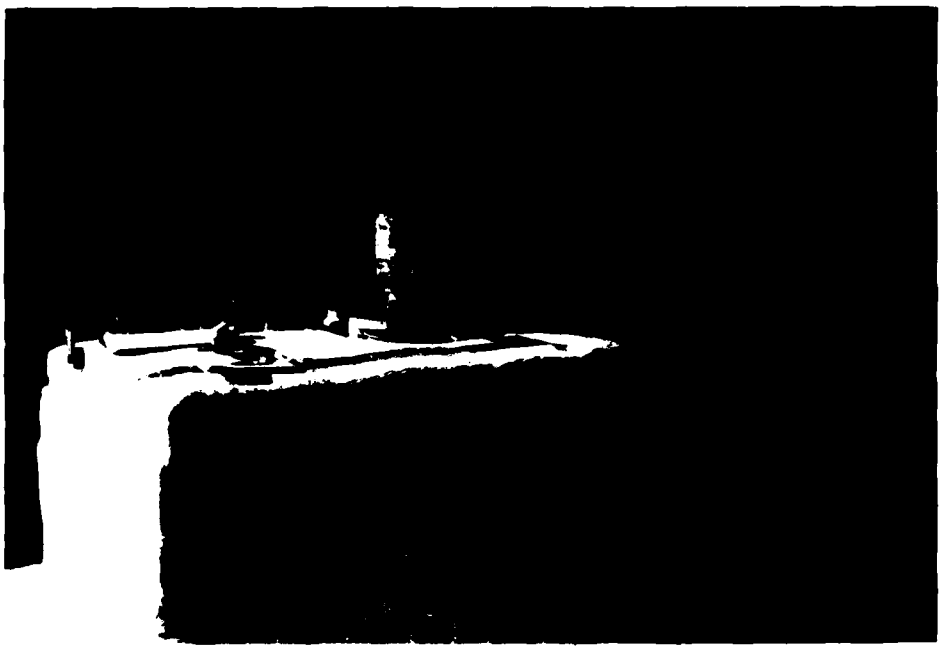
C-1 DAM AND SPILLWAY - LOOKING WEST

C-2 UPSTREAM FACE OF DAM - LOOKING SOUTH



C-3 EASTERN TOP OF DAM AT SPILLWAY

C-4 WESTERN TOP OF DAM AT SPILLWAY



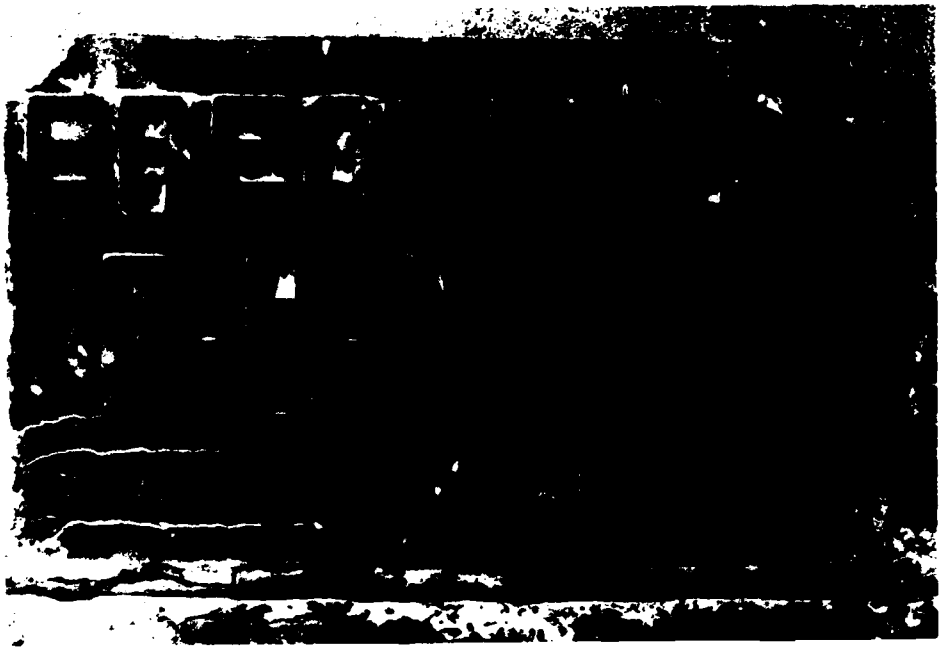
C-5 OUTLET CONTROL MECHANISM ON EASTERN TOP OF DAM FOR 30 INCH PIPE

C-6 SUSPECTED OUTLET CONTROL MECHANISM ON EASTERN TOP OF DAM - USE UNKNOWN

C-7 2 FOOT SQUARE OPENING IN THE DOWNSTREAM FACE OF THE SPILLWAY SECTION OF THE DAM

C-8 EASTERN DOWNSTREAM FACE OF DAM SHOWING LEAKAGE (DARK STONES), PLAQUE, WALLS, AND TREES

C-9 WESTERN DOWNSTREAM FACE OF DAM SHOWING LEAKAGE



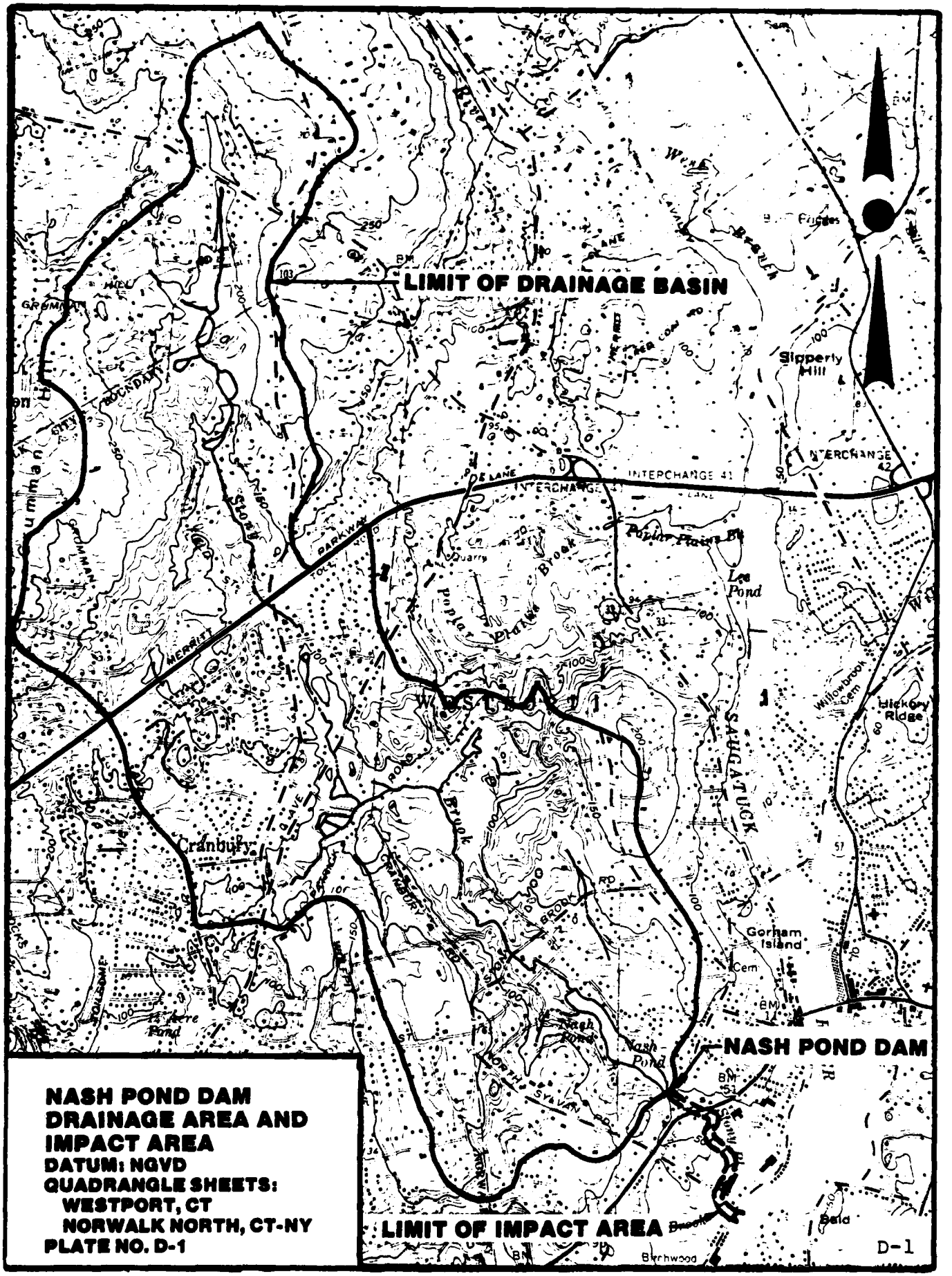
C-10 PLAQUE ON EASTERN DOWNSTREAM FACE

C-11 24 INCH VERTICAL BLOWOFF FROM 30 INCH OUTLET PIPE

C-12 DOWNSTREAM CHANNEL - LOOKING FROM EASTERN TOP OF DAM

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS


LIMIT OF DRAINAGE BASIN
NASH POND DAM
LIMIT OF IMPACT AREA
Slippery Hill
Lee Pond
Poplar Plains Brook
Cranbury
Gorham Island
Hickory Ridge
Willowbrook Cem
Nash Pond
Birchwood
INTERCHANGE 41
INTERCHANGE 42
MERRITT PARKWAY
SAUGATUCK
NASH POND DAM
DRAINAGE AREA AND
IMPACT AREA
DATUM: NGVD
QUADRANGLE SHEETS:
WESTPORT, CT
NORWALK NORTH, CT-NY
PLATE NO. D-1
D-1

HYDROLOGIC AND HYDRAULIC ANALYSIS
SUMMARY SHEET

Dam Nash Pond Dam

Test Flood 1/2 PMF

INFLOW HYDROGRAPH DEVELOPMENT

Drainage Area 3.05 sq. mi.

Probable Maximum Precipation
24 hour - 200 square mile PMP 22 inches

Initial Railfall Loss 0 Inch
Uniform Railfall loss .1 Inch

Snyder's Lag 3.6 hours
Snyder's Peaking Coefficient .625

Test Flood Inflow 2650 CFS

PMF Inflow 5300 CFS

RESERVOIR ROUTING AND DAM OVERTOPPING

Test Flood Outflow 2570 CFS

Spillway Capacity at Top of Dam 250 CFS
10 % of Test Flood

Flow Over Spillway at Test Flood 800 CFS

Spillway Crest Elevation 57.0 Feet
Top of Dam Elevation 60.2 Feet
Test Flood Elevation 64.0 Feet

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********
    1                A1       DAM SAFETY ANALYSIS - JOB NO. 79-905 / 06  ERJ
    2                A2       NASH POND DAM - WESTPORT, CT.
    3                A3       01-08-80
    4                H     75        1        0        0        0        0        0        2        0        0
    5                R1     5
    6                J      1        2        1
    7                J1    .5      1.0
    8                K      0        1        0        0        0        0        1        0
    9                K1       COMPUTATION OF PMF - DEVELOPMENT OF INFLOW HYDROGRAPH
   10                M      1        1      3.1        0      3.1        0        0        0        1
   11                P      0      22.     110.     124.     133.     142.
   12                T      0        0        0        0        0        0        0       .1
   13                W    3.6     .625
   14                X    1.7      .05      2.0
   15                K      1        1        0        0        0        0        1
   16                K1       ROUTING INFLOW HYDROGRAPH THRU LAKE- OVERTOPPING ANALYSIS
   17                Y      0        0        0        1        1
   18                Y1     1        0        0        0        0        0       -1
   19                $A    11.      25.      65.
   20                $E    57.    60.2      70.
   21                $$    57.    16.0      2.7      1.5
   22                $D  60.2      2.7      1.5     89.
   23                K     99
```

****
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 01/24/80.
TIME= 14.26.40.

DAM SAFETY ANALYSIS - JOB NO. 79-905 / 06 EMJ
NASH POND DAM - WESTPORT, CT.
01-08-80

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
75	1	0	0	0	0	0	2	0	0

JOPER	NRT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 2 LRTIO= 1
RTIOS= .50 1.00

D-4

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

COMPUTATION OF PMF - DEVELOPMENT OF INFLOW HYDROGRAPH

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUNG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	3.10	0.00	3.10	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	110.00	124.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	0.00	.10	0.00	0.00

UNIT HYDROGRAPH DATA
TP= 3.60 CP= .63 NTA= 0

RECESSION DATA
STRTQ= 1.70 QRCSN= .05 RTIOR= 2.00
APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 4.14 AND R= 3.37 INTERVALS

UNIT HYDROGRAPH 20 END-OF-PERIOD ORDINATES, LAG= 3.63 HOURS, CP= .63 VOL= 1.00

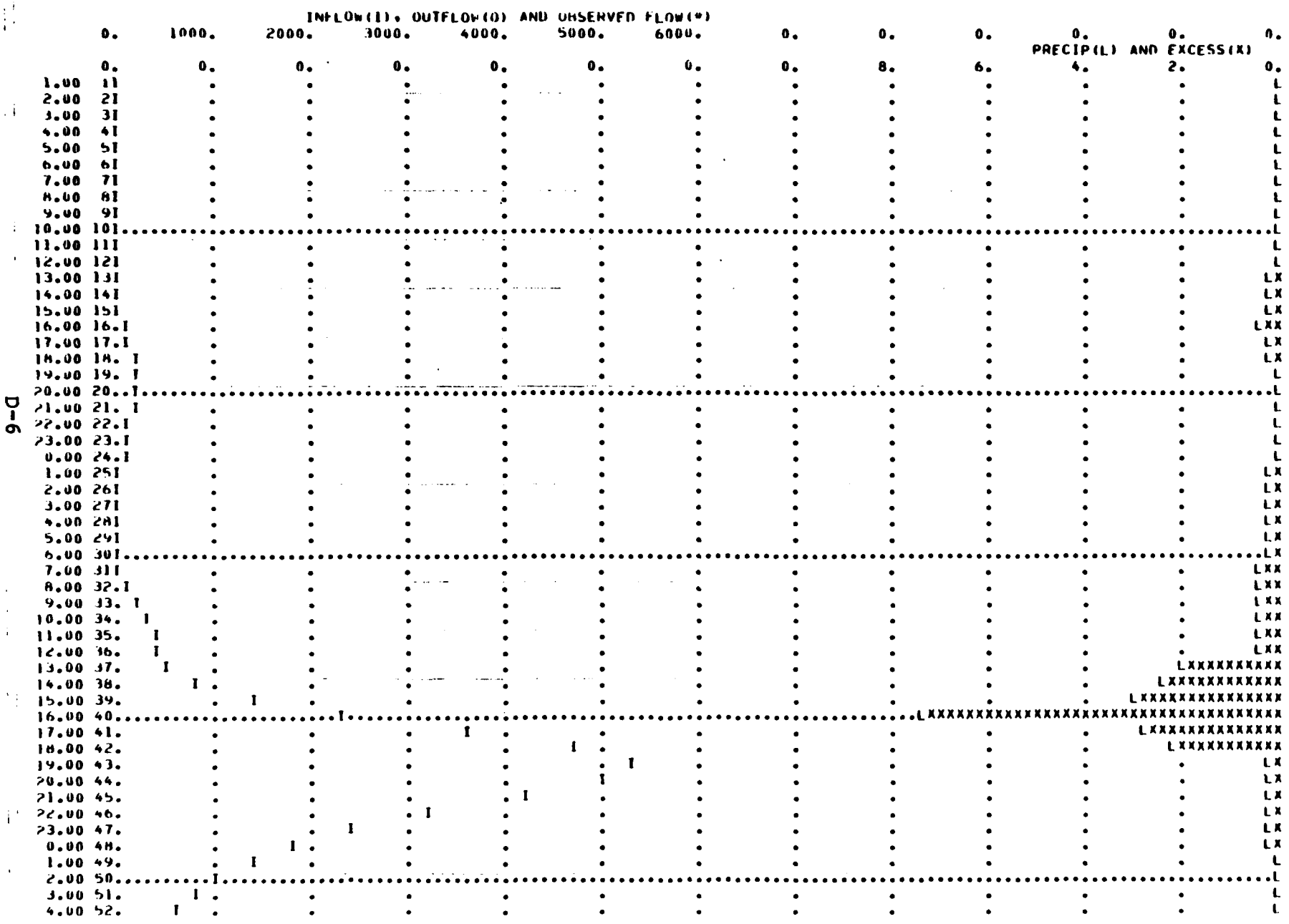
43.	155.	277.	339.	304.	228.	169.	125.	93.	69.
51.	38.	28.	21.	15.	11.	8.	6.	5.	3.

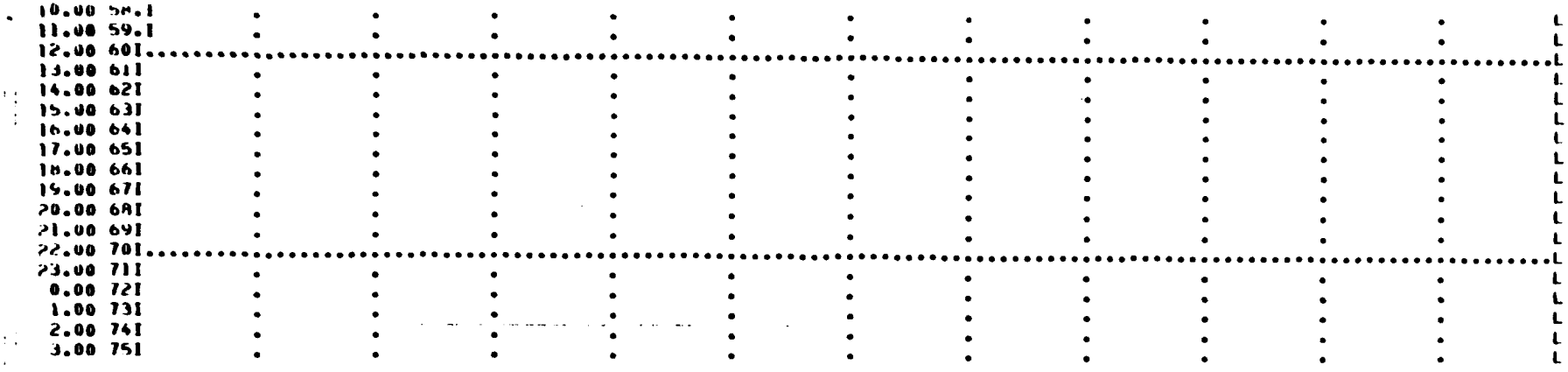
1.01	2.00	2	.01	0.00	.01	1.	1.02	15.00	39	2.90	2.80	.10	1368.
1.01	3.00	3	.01	0.00	.01	1.	1.02	16.00	40	7.36	7.26	.10	2298.
1.01	4.00	4	.01	0.00	.01	1.	1.02	17.00	41	2.71	2.61	.10	3558.
1.01	5.00	5	.01	0.00	.01	1.	1.02	18.00	42	2.13	2.03	.10	4721.
1.01	6.00	6	.01	0.00	.01	1.	1.02	19.00	43	.16	.06	.10	5298.
1.01	7.00	7	.03	0.00	.03	1.	1.02	20.00	44	.16	.06	.10	5004.
1.01	8.00	8	.03	0.00	.03	1.	1.02	21.00	45	.16	.06	.10	4154.
1.01	9.00	9	.03	0.00	.03	1.	1.02	22.00	46	.16	.06	.10	3219.
1.01	10.00	10	.03	0.00	.03	1.	1.02	23.00	47	.16	.06	.10	2421.
1.01	11.00	11	.03	0.00	.03	1.	1.03	0.00	48	.16	.06	.10	1825.
1.01	12.00	12	.03	0.00	.03	1.	1.03	1.00	49	0.00	0.00	0.00	1380.
1.01	13.00	13	.13	.03	.10	2.	1.03	2.00	50	0.00	0.00	0.00	1044.
1.01	14.00	14	.16	.06	.10	8.	1.03	3.00	51	0.00	0.00	0.00	784.
1.01	15.00	15	.20	.10	.10	22.	1.03	4.00	52	0.00	0.00	0.00	583.
1.01	16.00	16	.50	.40	.10	59.	1.03	5.00	53	0.00	0.00	0.00	432.
1.01	17.00	17	.18	.08	.10	121.	1.03	6.00	54	0.00	0.00	0.00	319.
1.01	18.00	18	.14	.04	.10	183.	1.03	7.00	55	0.00	0.00	0.00	236.
1.01	19.00	19	.01	0.00	.01	213.	1.03	8.00	56	0.00	0.00	0.00	174.
1.01	20.00	20	.01	0.00	.01	197.	1.03	9.00	57	0.00	0.00	0.00	124.
1.01	21.00	21	.01	0.00	.01	156.	1.03	10.00	58	0.00	0.00	0.00	87.
1.01	22.00	22	.01	0.00	.01	119.	1.03	11.00	59	0.00	0.00	0.00	57.
1.01	23.00	23	.01	0.00	.01	89.	1.03	12.00	60	0.00	0.00	0.00	24.
1.02	0.00	24	.01	0.00	.01	66.	1.03	13.00	61	0.00	0.00	0.00	11.
1.02	1.00	25	.11	.01	.10	49.	1.03	14.00	62	0.00	0.00	0.00	3.
1.02	2.00	26	.11	.01	.10	37.	1.03	15.00	63	0.00	0.00	0.00	2.
1.02	3.00	27	.11	.01	.10	30.	1.03	16.00	64	0.00	0.00	0.00	1.
1.02	4.00	28	.11	.01	.10	25.	1.03	17.00	65	0.00	0.00	0.00	1.
1.02	5.00	29	.11	.01	.10	21.	1.03	18.00	66	0.00	0.00	0.00	0.
1.02	6.00	30	.11	.01	.10	19.	1.03	19.00	67	0.00	0.00	0.00	0.
1.02	7.00	31	.41	.31	.10	30.	1.03	20.00	68	0.00	0.00	0.00	0.
1.02	8.00	32	.41	.31	.10	76.	1.03	21.00	69	0.00	0.00	0.00	0.
1.02	9.00	33	.41	.31	.10	159.	1.03	22.00	70	0.00	0.00	0.00	0.
1.02	10.00	34	.41	.31	.10	262.	1.03	23.00	71	0.00	0.00	0.00	0.
1.02	11.00	35	.41	.31	.10	354.	1.04	0.00	72	0.00	0.00	0.00	0.
1.02	12.00	36	.41	.31	.10	422.	1.04	1.00	73	0.00	0.00	0.00	0.
1.02	13.00	37	1.94	1.84	.10	540.	1.04	2.00	74	0.00	0.00	0.00	0.
							1.04	3.00	75	0.00	0.00	0.00	0.
									SUM	24.99	21.72	3.27	43233.
										(635.)	(552.)	(83.)	(1224.22)

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5298.	4249.	1724.	600.	43234.
CMS	150.	120.	49.	17.	1224.
INCHES		12.75	20.69	21.62	21.62
MM		323.85	525.52	549.21	549.21
AC-FT		2107.	3419.	3573.	3573.
THOUS CU M		2599.	4217.	4407.	4407.

OVF

STATION 1

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19.00 67I
20.00 68I
21.00 69I
22.00 70I
23.00 71I
0.00 72I
1.00 73I
2.00 74I
3.00 75I

DVN

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 1

1.	1.	1.	1.	1.	1.	1.	0.	0.	0.
0.	0.	1.	4.	11.	30.	61.	91.	106.	99.
79.	60.	44.	33.	25.	19.	15.	12.	11.	9.
15.	38.	80.	131.	177.	211.	270.	416.	684.	1149.
1779.	2361.	2649.	2502.	2077.	1609.	1210.	912.	690.	522.
392.	292.	216.	160.	118.	87.	62.	43.	28.	12.
5.	1.	1.	1.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2649.	2124.	862.	300.	21617.
CMS	75.	60.	24.	9.	612.
INCHES		6.38	10.34	10.81	10.81
MM		161.93	262.76	274.60	274.60
AC-FT		1053.	1709.	1787.	1787.
THOUS CU M		1299.	2109.	2204.	2204.

HYDROGRAPH AT STA 1 FOR PLAN 1, RTIO 2

2.	1.	1.	1.	1.	1.	1.	1.	1.	1.
1.	1.	2.	8.	22.	59.	121.	183.	213.	197.
158.	119.	89.	66.	49.	37.	30.	25.	21.	19.
30.	76.	159.	262.	354.	422.	540.	831.	1368.	2298.
3558.	4721.	5298.	5004.	4154.	3219.	2421.	1825.	1380.	1044.
784.	583.	432.	319.	236.	174.	124.	87.	57.	24.
11.	3.	2.	1.	1.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.					

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5298.	4249.	1724.	600.	43234.
CMS	150.	120.	49.	17.	1224.
INCHES		12.75	20.69	21.62	21.62
MM		323.85	525.52	549.21	549.21
AC-FT		2107.	3419.	3573.	3573.
THOUS CU M		2599.	4217.	4407.	4407.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTING INFLOW HYDROGRAPH THRU LAKE- OVERTOPPING ANALYSIS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	1	0	0	0	0	1	0	0

ROUTING DATA

GLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

SURFACE AREA= 11. 25. 65.

CREL	SPWID	COOW	EXPW	ELEVL	COOL	CAREA	EXPL
57.0	16.0	2.7	1.5	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COOD	EXPD	DAMWID
60.0	2.7	1.5	89.

STATION 1, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	5.	14.	31.	52.	68.
75.	73.	66.	57.	48.	40.	33.	27.	23.	19.
17.	20.	31.	54.	86.	122.	161.	221.	406.	830.
1410.	2038.	2489.	2573.	2298.	1860.	1433.	1088.	830.	636.
489.	376.	293.	241.	208.	173.	141.	111.	87.	65.
47.	34.	24.	18.	13.	10.	8.	6.	5.	4.
3.	3.	2.	2.	2.					

STORAGE

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	1.	1.	3.	6.	10.	15.	18.
20.	19.	18.	16.	14.	12.	10.	9.	8.	7.
7.	7.	10.	15.	22.	30.	38.	50.	70.	95.
123.	152.	171.	175.	163.	144.	124.	108.	95.	84.
75.	68.	61.	55.	48.	40.	34.	27.	22.	18.
14.	11.	8.	7.	5.	4.	4.	3.	3.	2.
2.	2.	2.	1.	1.					

STAGE

57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
57.0	57.0	57.0	57.1	57.1	57.2	57.5	57.8	58.1	58.4
58.4	58.4	58.3	58.2	58.1	58.0	57.8	57.7	57.7	57.6
57.5	57.6	57.8	58.2	58.6	59.0	59.4	60.0	60.7	61.6
62.5	63.4	63.9	64.0	63.7	63.1	62.6	62.0	61.6	61.2
60.9	60.7	60.4	60.1	59.8	59.5	59.2	58.9	58.6	58.3
58.1	57.9	57.7	57.6	57.5	57.4	57.3	57.3	57.2	57.2
57.2	57.2	57.1	57.1	57.1					

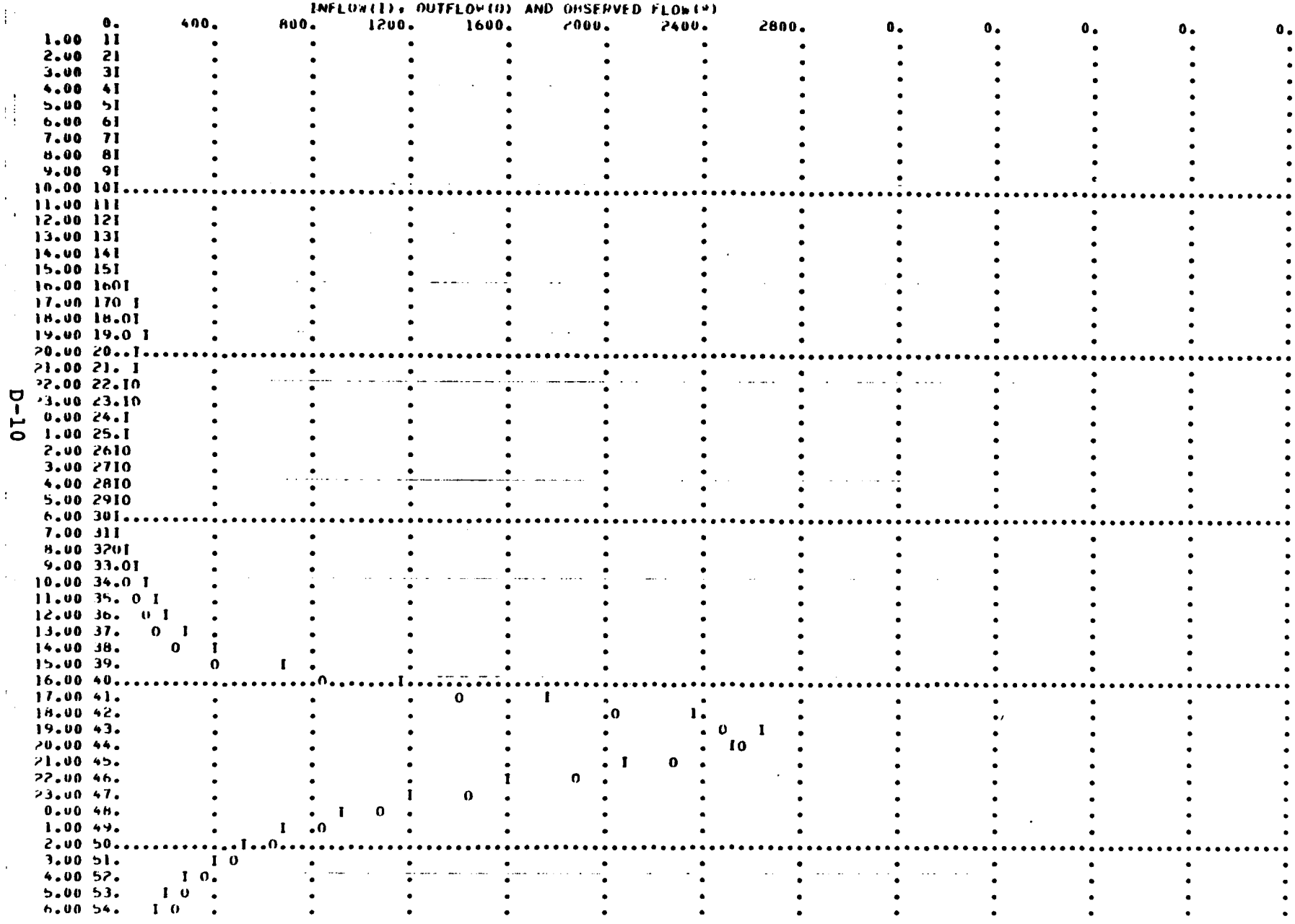
PEAK OUTFLOW IS 2573. AT TIME 44.00 HOURS

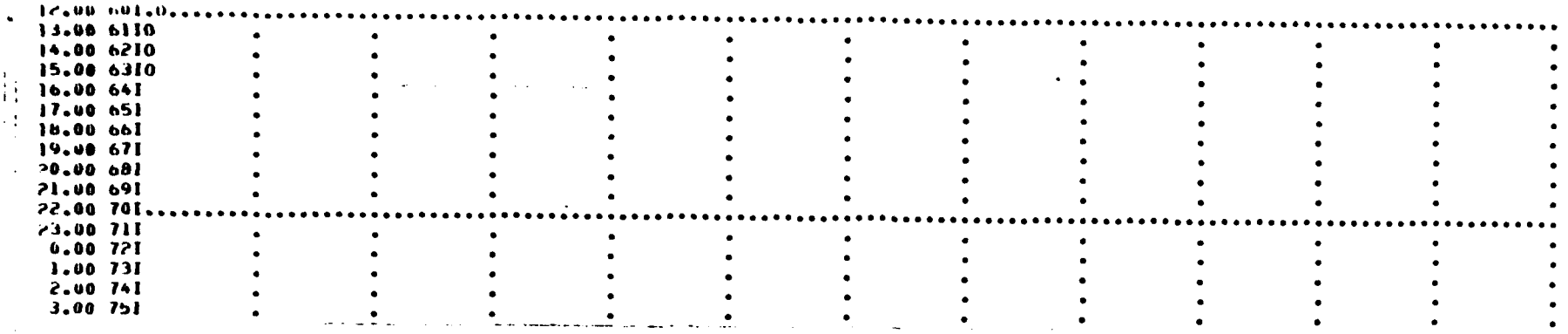
	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	2573.	2113.	855.	300.	21602.
CMS	73.	60.	24.	8.	612.
INCHES		6.34	10.26	10.80	10.80
MM		161.08	260.57	274.42	274.42
AC-FT		1048.	1695.	1785.	1785.
THOUS CU M		1293.	2091.	2202.	2202.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

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16.00 641
17.00 651
18.00 661
19.00 671
20.00 681
21.00 691
22.00 701
23.00 711
0.00 721
1.00 731
2.00 741
3.00 751

OVN

STATION 1, PLAN 1, RATIO 2

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	1.	1.	1.	1.
1.	1.	1.	1.	3.	12.	33.	70.	112.	143.
154.	149.	134.	115.	96.	79.	64.	52.	43.	36.
33.	39.	63.	112.	177.	245.	393.	627.	1044.	1783.
2890.	4108.	4984.	5146.	4596.	3710.	2862.	2145.	1625.	1237.
941.	714.	540.	410.	316.	251.	217.	181.	145.	110.
80.	56.	40.	28.	21.	15.	12.	9.	7.	5.
4.	4.	3.	3.	2.					

STORAGE

0.	0.	0.	0.	0.	1.	1.	1.	1.	1.
1.	1.	1.	1.	2.	5.	10.	19.	28.	34.
36.	35.	32.	28.	24.	21.	17.	15.	13.	11.
10.	12.	17.	27.	41.	56.	69.	84.	105.	140.
189.	242.	280.	287.	263.	225.	187.	156.	133.	115.
100.	88.	78.	70.	63.	57.	50.	42.	34.	27.
21.	16.	12.	9.	7.	6.	5.	4.	3.	3.
2.	2.	2.	2.	2.					

STAGE

57.0	57.0	57.0	57.0	57.0	57.0	57.1	57.1	57.1	57.1
57.1	57.1	57.1	57.1	57.2	57.4	57.8	58.4	58.9	59.2
59.3	59.3	59.1	58.9	58.7	58.5	58.3	58.1	58.0	57.9
57.8	57.9	58.3	58.9	59.6	60.2	60.7	61.2	62.0	63.0
64.3	65.6	66.4	66.6	66.1	65.2	64.3	63.5	62.8	62.3
61.8	61.4	61.0	60.7	60.5	60.2	59.9	59.6	59.2	58.9
58.5	58.2	57.9	57.8	57.6	57.5	57.4	57.3	57.3	57.3
57.2	57.2	57.2	57.2	57.1					

PEAK OUTFLOW IS 5146. AT TIME 44.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	5146.	4235.	1713.	600.	43217.
CMS	146.	120.	49.	17.	1224.
INCHES		12.71	20.56	21.61	21.61
MM		322.79	522.19	548.99	548.99
AC-FT		2100.	3397.	3572.	3572.
THOUS CU M		2590.	4191.	4406.	4406.

OVF

STATION 1

INFLOW(I), OUTFLOW(O) AND OBSERVED FLOW(*)

```
        0.     1000.     2000.     3000.     4000.     5000.     6000.      0.      0.      0.      0.      0.      0.
 1.00  11
 2.00  21
 3.00  31
 4.00  41
 5.00  51
 6.00  61
 7.00  71
 8.00  81
 9.00  91
10.00 101.....................................................................................................
11.00 111
12.00 121
13.00 131
14.00 141
15.00 151
16.00 1601
17.00 1701
18.00 18.01
19.00 19.01
20.00 20.01...................................................................................................
21.00 21. I
22.00 22.1
23.00 23.I
 0.00 24.I
 1.00 2510
 2.00 2610
 3.00 2710
 4.00 2810
 5.00 291
 6.00 301.....................................................................................................
 7.00 311
 8.00 3201
 9.00 33.01
10.00 34.0 I
11.00 35. 0 I
12.00 36. 0 I
13.00 37.  01
14.00 38.    0 I
15.00 39.      0  I
16.00 40.....................0....I.....................................................................
17.00 41.                  0.    I
18.00 42.                       .0    I
19.00 43.                             0  I
20.00 44.                             I0
21.00 45.                          I   0
22.00 46.                    I     0
23.00 47.                 I    0
 0.00 48.              I .0
 1.00 49.           I 0
 2.00 50.........I.0...........................................................................................
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 4.00 52.    I0
 5.00 53.  10
 6.00 54. 10
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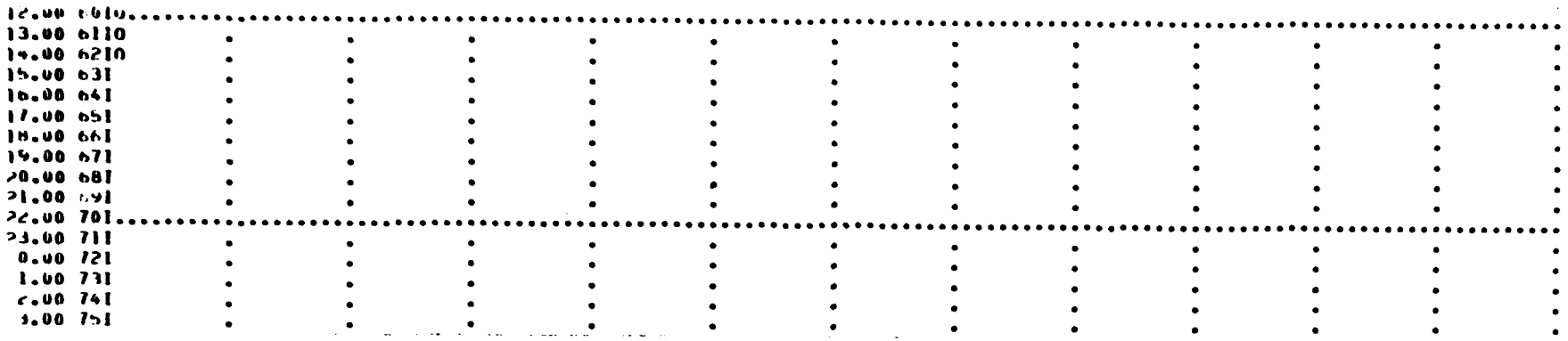
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18.00 661
19.00 671
20.00 681
21.00 691
22.00 701
23.00 711
0.00 721
1.00 731
2.00 741
3.00 751

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .50	RATIO 2 1.00
HYDROGRAPH AT	1	3.10	1	2649.	5298.
	(	8.03)	(	75.01)(	150.02)(
ROUTED TO	1	3.10	1	2573.	5146.
	(	8.03)	(	72.85)(	145.71)(

SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	57.00	57.00	60.20
STORAGE	0.	0.	56.
OUTFLOW	0.	0.	247.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	63.99	3.79	175.	2573.	15.00	44.00	0.00
1.00	66.57	6.37	287.	5146.	20.00	44.00	0.00

NASH POND DAM

Dam Failure Analysis

1. Failure discharge with pool at top of dam (elev. 60.2) = 3360 CFS
2. Depth of water in reservoir at time of failure = 25 ft.
3. Maximum depth of flow downstream of dam = 12 ft.
4. Water surface elevation just downstream of dam at time of failure) = 47.0 NGVD

The failure discharge of 3360 CFS will enter and flow downstream 3000 feet until the brook reaches the Saugatuck River. Valley storage in this 3000 feet length of brook is substantial in reducing the discharge. Also due to roughness characteristics, obstructions and frictional losses, it is very likely that the unsteady dam failure flow will dissipate its wave and kinetic energy and thus convert to steady and uniform flow obeying Manning's formulae 3000 feet downstream. The failure profile will have the following hydraulic characteristics:

DISTANCE FROM THE DAM	WATER SURFACE ELEVATION NGVD	REMARKS
0	60.2	Upstream of Dam
0	47.0	Downstream of Dam
1000	32.0	
2000	8.5	
3000	0-1 foot above normal	Saugatuck River

Beyond 3000 feet N/A failure discharge will flow in the below given channel characteristics:

Q = N/A CFS; S = N/A

n = N/A ; b = N/A ; d = N/A

"Rule of Thumb Guidance for Estimating Downstream Dam Failure Analysis"

DATA

Name of Dam NASH POND DAM

Location in Westport, 0.6 miles northwest of Bald Mtn.

Drainage Area 3.05 sq. mi., Top of Dam 60.2 NGVD

Spillway Type Overflow-Broadcrest, Crest of Spillway 57.0 NGVD

Surface Area @ Crest Elev. 11.0 Acres = 0.017 sq. mi.

Pool Bottom Near Dam = 35.0 NGVD (Downstream)

Assumed Side Slopes of Embankments = 2:1

Depth of Pool at Dam (Yo) = 25 Feet

Mid-Height Elev. 47.5 NGVD

Length of Dam at Crest = 105 Feet

Length of Dam at Mid-Height = 65 Feet

25% of Dam Length at Mid-Height = W_b = 16 Feet

Step 1

Storage (S) at time of failure 114 Ac-FT
(Equal to top of dam)

Step 2

Peak Failure Discharge

$Q_{pl} = 8/27\ W_b \sqrt{g}\ Yo^{3/2}$

$= 1.68\ W_b\ Yo^{3/2} =$ 3360 cfs

Failure is assumed to coincide with pool elevation at top of dam.

The Saugatuck River is located 3000 feet downstream of Nash Pond dam. There is a 30 foot drop into the river which will cause the dissipation of wave and kinetic energy of the failure discharge. Approximately, the water surface elevations between Nash Pond dam and the Saugatuck River will be as given on Dam Failure Analysis. The increase of depth in the river due to failure of Nash Pond dam is estimated to be 0-1 foot.

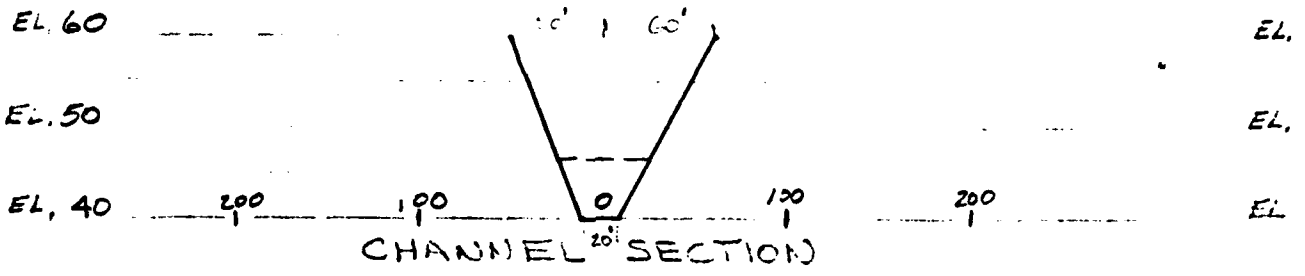
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NASH POND DAM

SECTION LOCATION: @ FACE DOWNSTREAM OF DAM

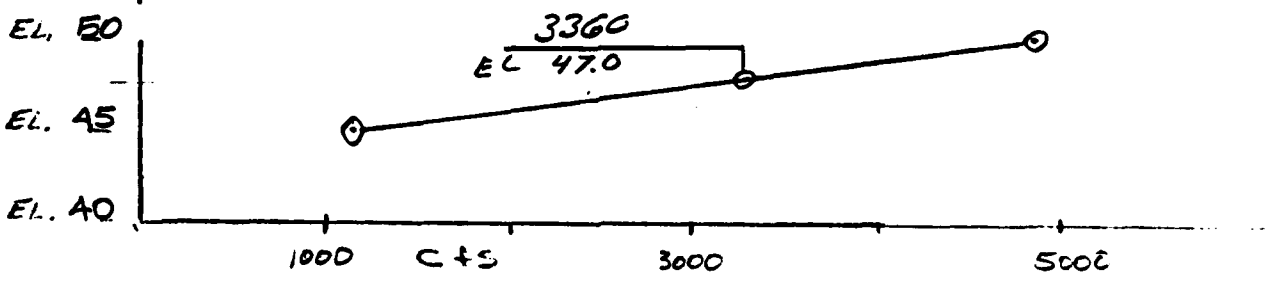
USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

WHERE: n = 0.05 S = SLOPE = 0.012 1/1



Q_{P_1} = 3360 STORAGE (S) 116 AC-FT

ELEV	AREA	W/P	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
50	425	65	6.54	3.50	.11	29.72	4859	10
45	150	40	3.75	2.41	.11	29.72	1184	5
						29.72		



DEPTH @ DOWNSTREAM FACE = 12.0 EL 47.0'

STAGE DISCHARGE = 3360 CFS ELEV = 47.0 OR A D = 7.0

NEXT DOWNSTREAM SECTION 1000 FT.

BY. FCB DATE 11/27/79 SUBJECT DAM INSPECTION STUDIES — NASH POND DAM — SHEET NO 2 OF 3

CHKD. BY ERJ DATE 1-15-80 — JOB NO 77-95/06

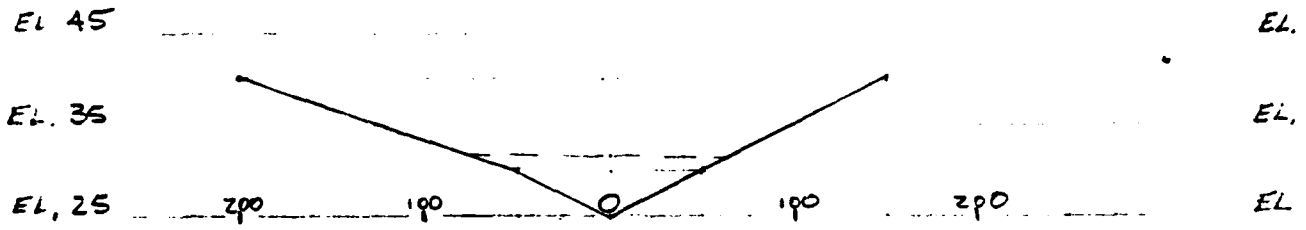
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NASH POND DAM

SECTION LOCATION: 1000 DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

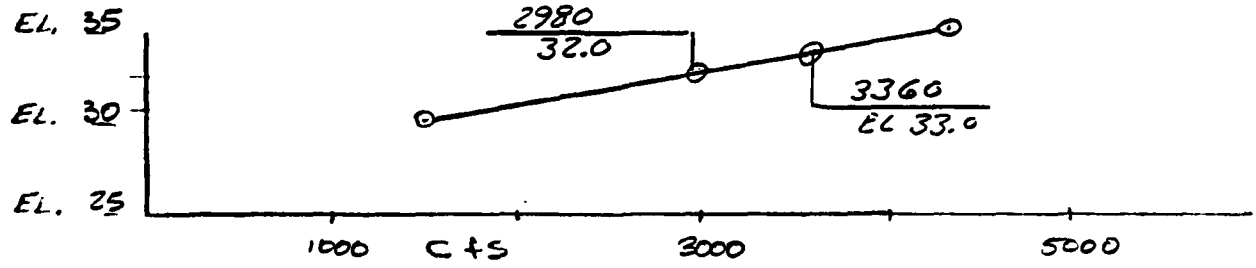
WHERE: n = 0.05 S = SLOPE = 0.012 1/1



CHANNEL SECTION

Q_{P_1} = 3360 cfs STORAGE (S) 116

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
30	250	100	2.5	1.84	.11	29.72	1504	5
35	656	225	2.92	2.04	.11	29.72	4378	
						29.72		



$V_1 = 12.0 \times \left(\frac{50+140}{2} \times 1000 \div 43560\right)^{(2.18)} 1/2 = 13.1$ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V/S) = 2980$ cfs

$V_2 = \frac{7.0+8.0}{2} \times 2.18 \times 1/2 = 8.2$ $V_{AVE} = 10.6$ Ac-ft

$Q_{P_2} = Q_{P_1}(1 - V_{AVE}/S) = 3050$ cfs

STAGE DISCHARGE = 3050 ELEV = 32 CC A D = 7.0

NEXT DOWNSTREAM SECTION 1000 ft.

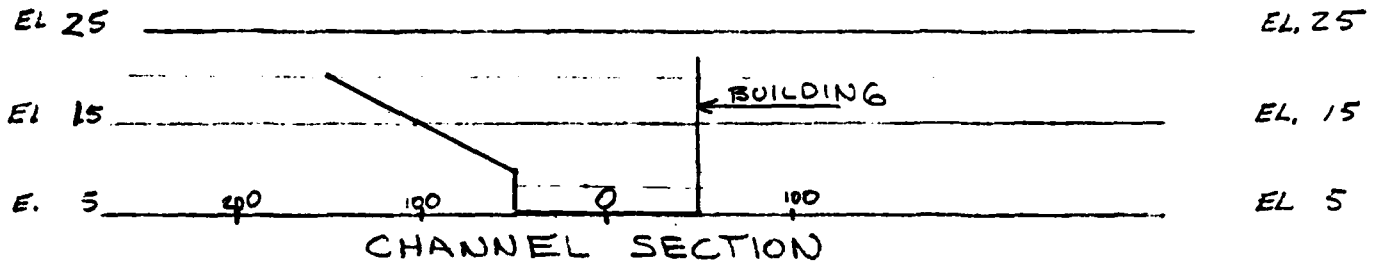
DOWNSTREAM W.S.EL. COMPUTATIONS

NAME OF DAM: NASH POND DAM

SECTION LOCATION: 2000' DOWNSTREAM OF DAM

USING: $Q = 1.486/n \, A \, R^{2/3} \, S^{1/2}$

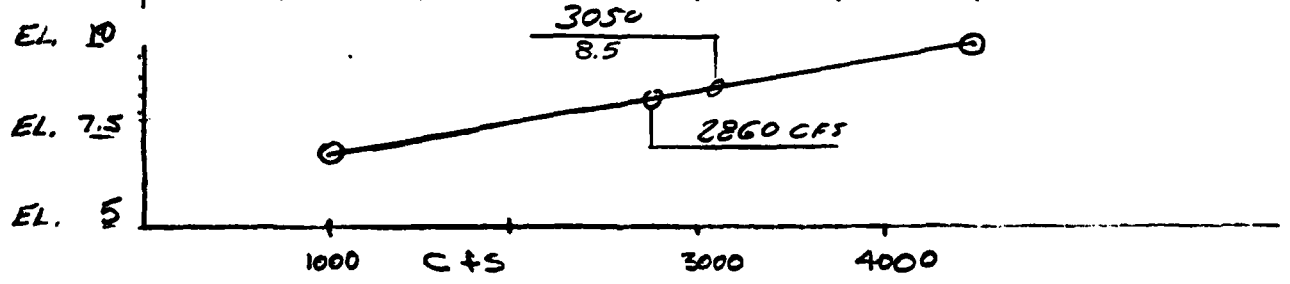
WHERE: n = 0.05 S = SLOPE = 0.012 1/1



CHANNEL SECTION

Q_{P_1} = 3050 cfs STORAGE (S) 116 Ac-ft

ELEV	AREA	WP	R	$R^{2/3}$	$S^{1/2}$	1.486/n	Q	DEPTH
5	500	110	4.55	2.74	.11	29.72	4486	5
2	200	104	1.92	1.55	.11	29.72	1011	2
						29.72		



$V_1 = \frac{7.0+3.5}{2} \left(\frac{140+100}{2} \times 1000 \div 43{,}560 \right)^{(2.75)} 1/2$ = 7.2 Ac-ft

$Q_{P_2} = Q_{P_1} (1 - V_1/S)$ = 2860 cfs

V_2 = = N/A Ac-ft V_{AVE} 7.2 Ac-ft.

$Q_{P_2} = Q_{P_1} (1 - V_{AVE}/S)$ = 2860 cfs

STAGE DISCHARGE = 2860 cfs ELEV = 8.5 OR A D = 3.5 ft

NEXT DOWNSTREAM SECTION N/A ft.

EFFECTS @ STAUGATUCK RIVER - MINOR SAY 0-1'

A. Size Classification

Height of dam = 25 ft.; hence small

Storage capacity at top of dam (elev. 60.2) = 114 AC-FT.; hence small

Adopted size classification small

B.i) Hazard Potential

This dam is located upstream of an urbanized area. Two commercial buildings and an apartment building are located along the channel immediately downstream from the dam.

ii) Impact of Failure of Dam at Maximum Pool (Top of Dam)

It is estimated from the rule of "thumb" failure hydrograph, that the following adverse impacts are a possibility by the failure of this dam.

a) Loss of homes Possibly 2-3;
b) Loss of buildings 1-2;
c) Loss of highways or roads No;
d) Loss of bridges No;

The failure profile can affect a distance of 3000 feet from the dam.

C. Hazard Potential Classifications

HAZARD	SIZE	TEST FLOOD RANGE
High	Small	1/2 PMF to PMF

Adopted Test Flood = 1/2 PMF = N/A CSM

= 2650 CFS

D. Overtopping Potential

Drainage Area 1951 acres = 3.05 sq. miles

Spillway crest elevation = 57.0 NGVD

Top of Dam Elevation = 60.2 NGVD

Maximum spillway discharge

Capacity without overtopping of dam = 250 CFS
"test flood" inflow discharge = 2650 CFS
"test flood" outflow discharge = 2570 CFS

RATING CURVE DEVELOPMENT

Nash Pond Dam

Spillway

$Q = C\ L\ H^{3/2}$

$C = 2.70$

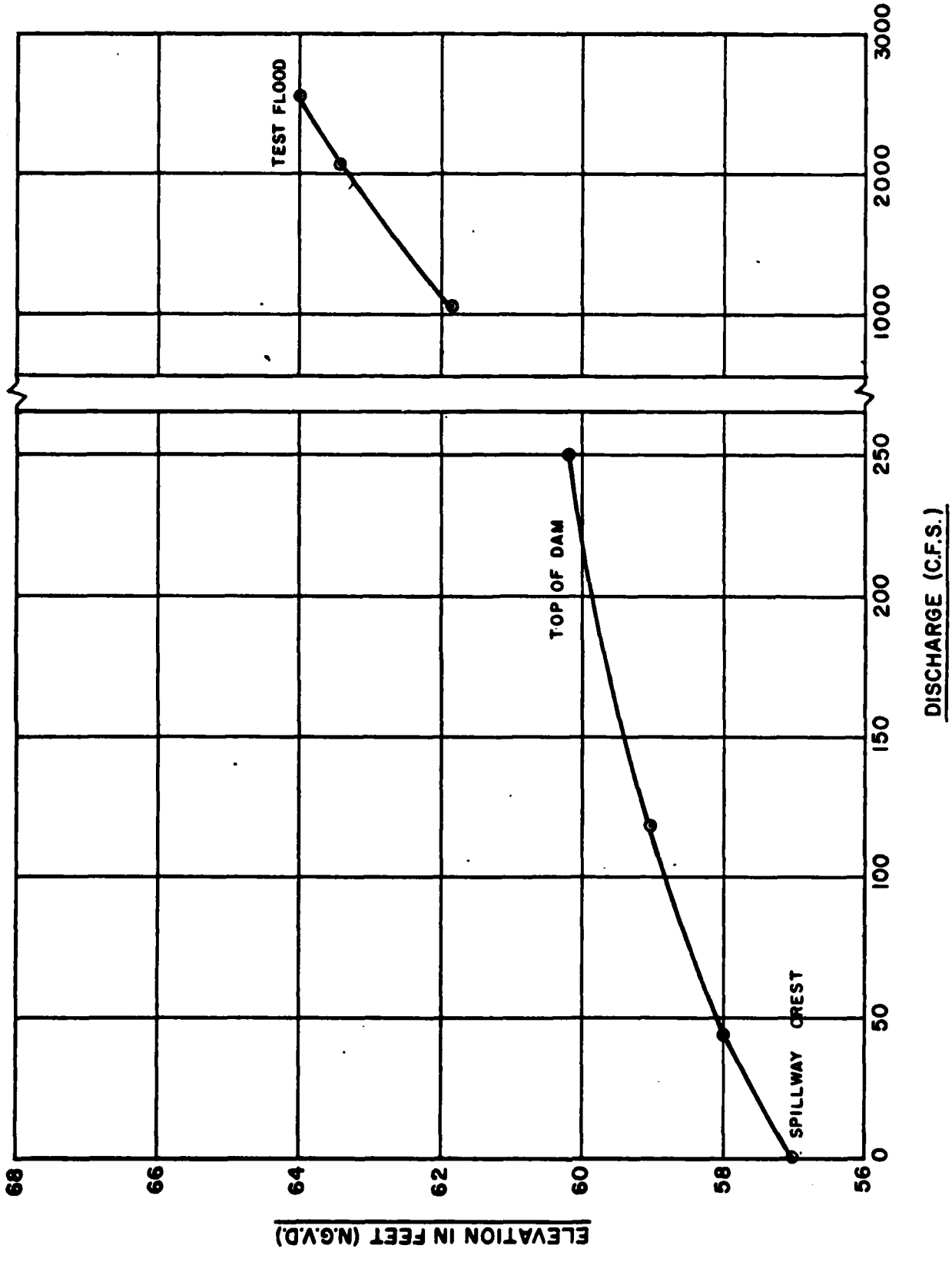
$L = 16$ feet

30 Inch Pipe

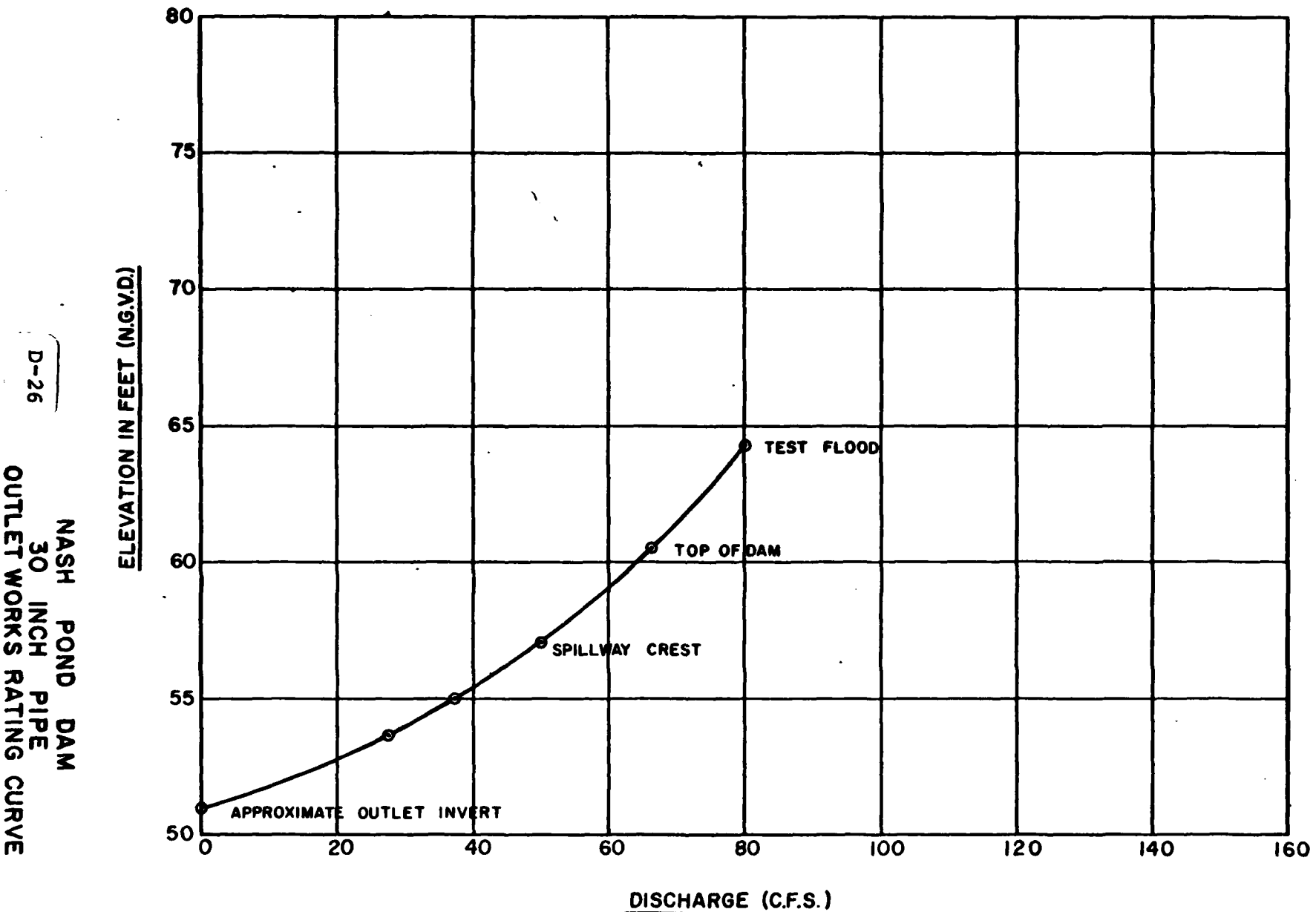
$Q = c\ a\ (2gh)^{1/2}$

$c = .6$

$a = 4.9$ square feet

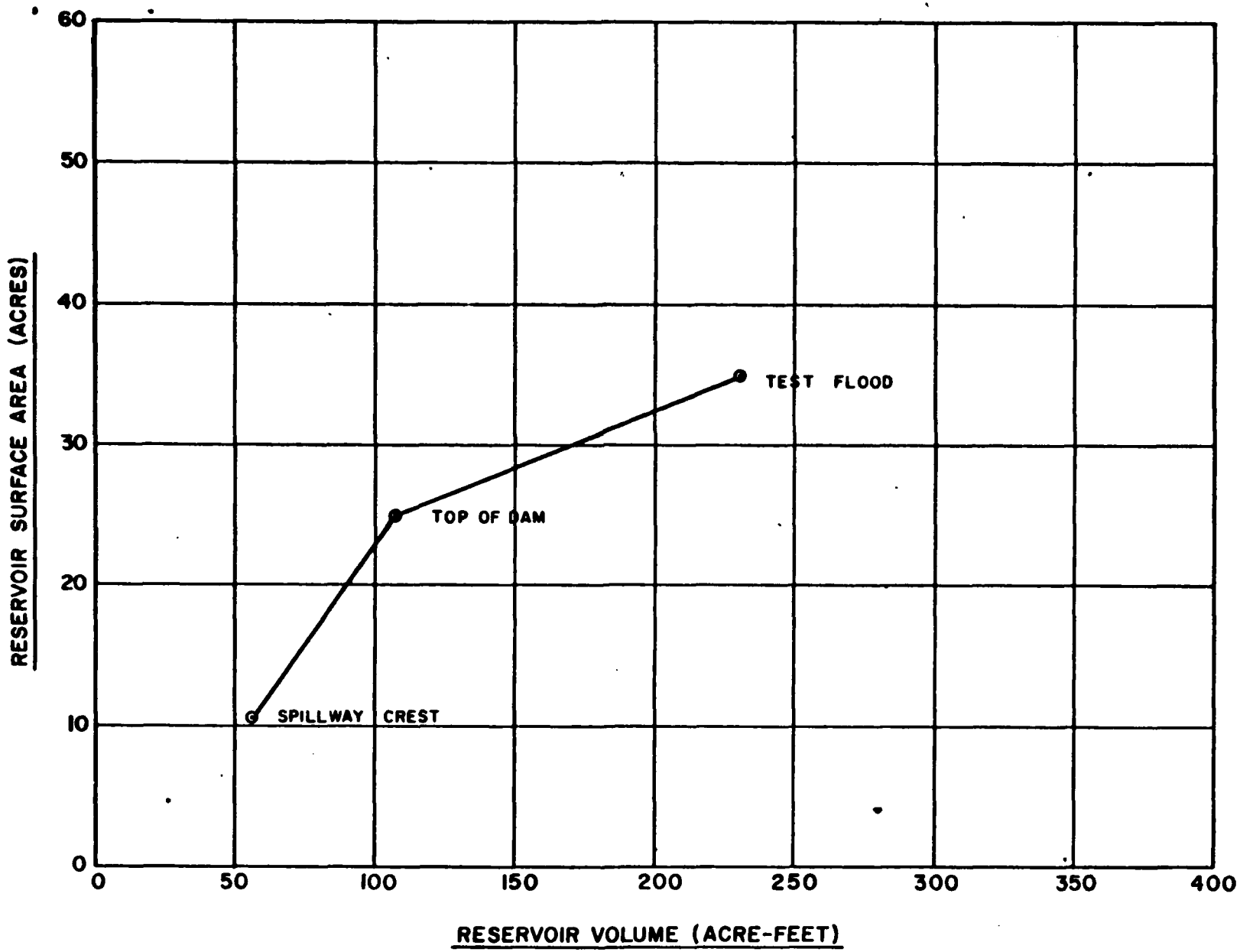


NASH POND DAM
SPILLWAY RATING CURVE



NASH POND DAM
30 INCH PIPE
OUTLET WORKS RATING CURVE

D-26



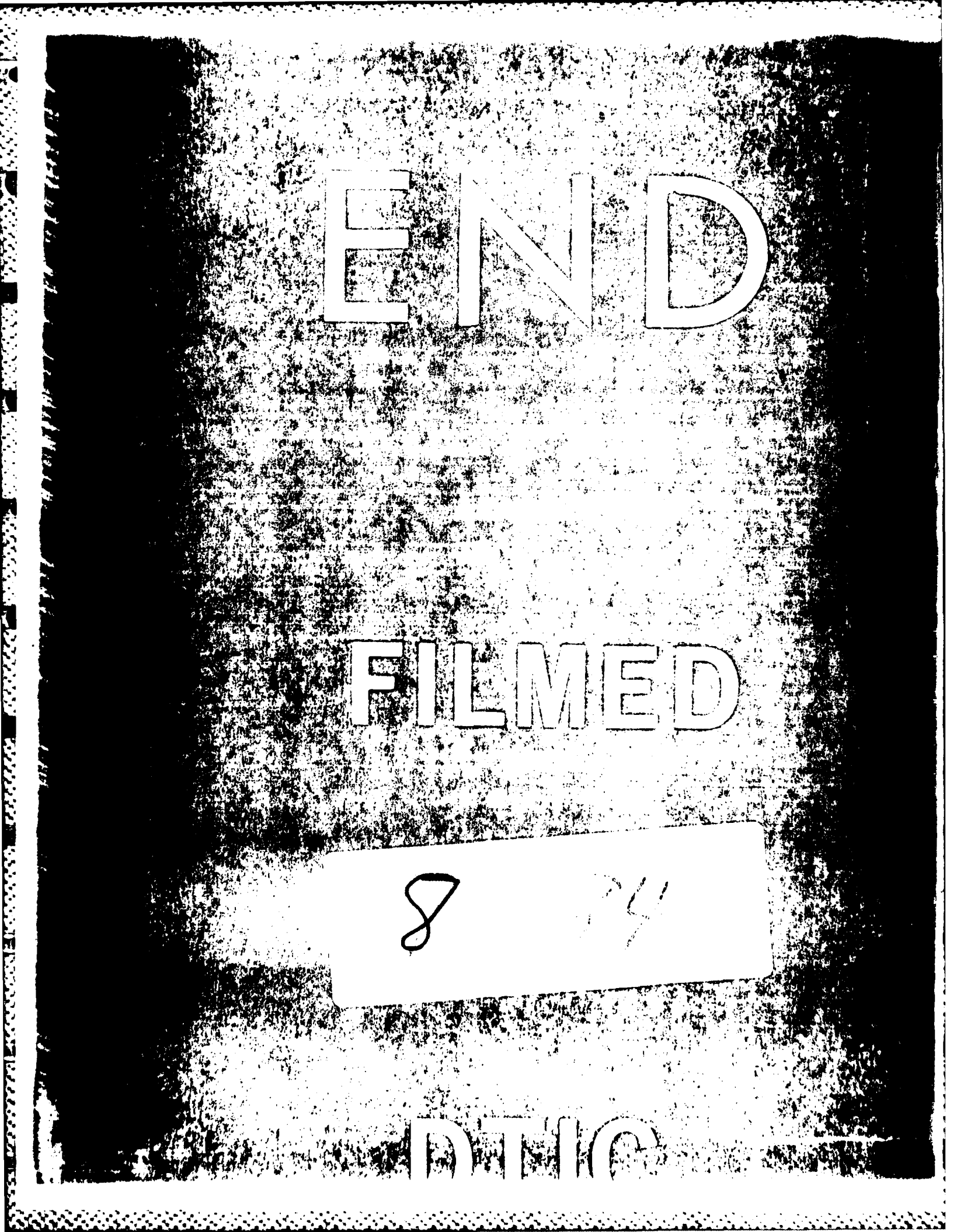
NASH POND DAM
RESERVOIR AREA-CAPACITY CURVE

APPENDIX E

INFORMATION AS CONTAINED IN THE

NATIONAL INVENTORY OF DAMS

NOT AVAILABLE AT THIS TIME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